

**CALFED**

**TECHNICAL REPORT  
ENVIRONMENTAL CONSEQUENCES**

**VEGETATION & WILDLIFE**

**DRAFT**

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## LIST OF ACRONYMS

BMPs	Best Management Practices
CALFED	CALFED Bay-Delta Program
DFG	California Department of Fish and Game
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CNPS	California Native Plant Society
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DWR	California Department of Water Resources
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ESA	Endangered Species Act
GIS	geographic information system
MAF	million acre-feet
NDDB	Natural Diversity Data Base
NEPA	National Environmental Policy Act
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
PEIS	Programmatic EIS
PL	Public Law
SR	State Route
SRFCP	Sacramento River Flood Control Project
SRA	shaded riverine aquatic
SWP	State Water Project
WHR	Wildlife-Habitat Relationship

# VEGETATION & WILDLIFE RESOURCES

## INTRODUCTION

This technical report describes impacts on vegetation and wildlife resources associated with implementation of the CALFED Bay-Delta Program (CALFED).

Numerous CALFED activities could result in potentially significant impacts, including:

- Constructing and filling storage reservoirs,
- Constructing restored habitats,
- Improving levee system integrity,
- Improving on-farm water use efficiency,
- Changing to crops that require less water,
- Fallowing cropland, and
- Constructing storage and conveyance facilities.

## ASSESSMENT METHODS

This programmatic impact analysis addresses impacts on plant communities and associated plants and wildlife—not impacts on individual species. Special-status species, rare natural communities, and significant natural areas are considered separately. A modified Holland system was used to classify plant communities. This community approach assumes that impacts on a particular plant community would be similar for the species that depend on that community.

Some CALFED actions would directly affect specific environmental variables such as water

flow, water quality, and substrate. Changes in environmental variables could affect plant communities—for example, by changing rates of erosion, sedimentation, or water availability; by directly creating new plant communities; or by removing or converting existing communities. Such changes could affect the quantity of plant communities and their associated wildlife. Such changes also could affect the number of special-status species and the area or quality of rare natural communities by altering existing foraging, living, and breeding areas.

In addition to direct impacts on plant community area, CALFED actions may result in changes in plant community quality. Changing water availability, for example, may not result in a change in the areal extent of a plant community but may result in changes in growth patterns or seed production that would affect the quality of the plant community. “Quality” is defined as a measure of the degree to which physical, chemical, and biological conditions provide for the growth, survival, and reproduction of the species, or group of species, associated with the plant community considered. Changes in quality were assessed for an associated group of species (plants and wildlife) as a whole, except when a species or group of species of particular interest would be affected differently. Habitat quality for special-status species was assessed for each individual species.

Two types of analysis were included: changes in areal extent due to direct loss, conversion, or creation of plant communities; and changes in quality. Changes to the areal extent of vegetation were defined and analyzed by using various tools that focus primarily on spatial analysis of plant community area. The change in acreage of each plant community was used as the quantitative measure of impacts on wetland and terrestrial habitats, associated vegetation

and wildlife, or species groups. Because details regarding the size and location of specific alternative features were not available, impacts were measured as estimates of gains or losses, or types of gains or losses that might be expected to occur. When details regarding size and location of features are known, more exact values of loss or conversion of plant communities will need to be determined.

Impacts were considered for the following general categories:

- Area of natural plant communities, including associated wildlife and plant species;
- Quality of natural plant communities, including associated wildlife and plant species, and changes in nonindigenous and introduced species;
- Area of agricultural land providing habitat value;
- Habitat patterns for plant communities (for example, spatial orientation of habitats, connectivity, and landscape-level diversity);
- Number of known special-status species or areas with critical habitat designation;
- Area and quality of plant communities occupied by special-status species; and
- Area and quality of rare natural communities or significant natural areas.

Changes in quality and quantity were the measures used to determine impacts of the alternatives being considered on the categories listed above.

Plant communities analyzed include seasonal wetlands, saline emergent wetlands, freshwater emergent wetlands, grassland, chaparral, valley foothill riparian, montane riparian, valley foothill hardwood, montane hardwood, and

mixed conifer forest. Agricultural areas were analyzed separately.

The assessment of qualitative impacts on plant communities considered geographic extent, distribution, quality, and spatial variation. An action that affects the continuity of a linear riparian plant community or drainage patterns in wetlands, for example, may have greater impacts than those resulting from changes in areal extent. The severity of impacts was determined by the magnitude of changes in quality or condition of the plant communities.

Broad groups of plant communities were addressed in the assessment, such as riparian and grasslands. An increase or decrease in the area of a particular plant community was used to indicate whether the populations of wildlife or plant species closely associated with the affected plant community would be beneficially or adversely affected.

Geographic comparisons were made using electronic databases and hard-copy maps of plant community distributions. Results of this analysis provided information on the likelihood of a particular alternative to affect a given plant community or special-status species.

When database or hard-copy maps of plant community distributions were not available for an area, effects of CALFED actions were assessed and described qualitatively, based on the current understanding of existing land use and how ecosystems function.

The ability of CALFED actions to control populations of non-native species was assessed qualitatively based on each treated community.

The best available information was used to assess impacts on special-status species. The California Department of Fish and Game's (DFG's) Natural Diversity Data Base (NDDB) location information on special-status plants and animal species and on rare natural communities was used in the analysis. Rare natural communities and significant natural areas were

treated qualitatively in part because specific data on the location of project features in relation to specific areas or communities generally were not available. DFG's mapping of vernal pools and the RAREFIND database and files were used to obtain some quantitative information regarding affects on rare natural communities.

Additional information concerning the assessment tools and methods for impact categories identified above are presented in the Supplement to this report.

Potential impacts resulting from changes in flow were acknowledged but could not be quantitatively addressed without modeled flow data. When modeled flow data are available, qualitative and quantitative assessments could be conducted on issues such as vegetation changes due to salinity distribution, flow velocity effects on erosion and sedimentation rates, and changes in water level that could affect vegetation and wildlife communities.

- Increase in the potential for outbreaks of wildlife diseases;
- Permanent loss of occupied special-status species habitat or direct mortality of special-status species;
- Reduction in the area or extent of special-status communities; and
- Reduction in area or habitat value of critical habitat areas designated under the federal Endangered Species Act (ESA).

Both temporary and permanent impacts were identified, as defined below.

**Temporary Impacts:** Impacts expected to result in short-term loss of habitat area or quality as a result of construction or restoration activities.

**Permanent Impacts:** Impacts expected to result in long-term loss of habitat area or quality as a result of construction or restoration activities.

## **SIGNIFICANCE CRITERIA**

For this analysis, an impact was considered potentially significant if implementing a CALFED action would result in:

- Temporary or permanent removal, filling, grading, or disturbance of wetlands and riparian communities;
- Substantial decrease in the area of important wildlife habitats or use areas in watersheds of major tributaries to the Sacramento and San Joaquin rivers;
- Substantial fragmentation or isolation of wildlife habitats or movement corridors, especially riparian and wetland habitats;
- Decrease in the amount of available forage for wintering waterfowl;

## **ENVIRONMENTAL CONSEQUENCES**

The impact assessment presented in this section begins with a comparison of the No Action Alternative to existing conditions, followed by an assessment for each of the geographic regions, in which the CALFED alternatives are compared to the No Action Alternative. At the level of detail possible for this programmatic assessment, only small and qualitative differences were identified between the No Action Alternative and existing conditions. Therefore, the analysis of CALFED actions compared to existing conditions is similar to the comparison to the No Action Alternative.



Table 1 summarizes potential impacts on vegetation and wildlife resources by CALFED alternative. Table 2 lists the habitats and plant communities that could be affected by CALFED actions.

### ***Comparison of No Action Alternative to Existing Conditions***

The differences between the No Action Alternative and existing conditions would result from changes in water project operations in response to new or modified facilities, increased or reduced demands, and new water resources projects that could affect the area and quality of existing habitat. New or modified facilities may include new surface water and groundwater storage, new conveyance, and modified reservoir discharge structures. Changes in demand for water could result from increased SWP and CVP needs, land retirement, full use of existing water rights, revised environmental flow needs, and increased wildlife refuge needs.

Table 3 compares major features of the No Action Alternative to existing conditions.

### **DELTA REGION**

Although operations and surface water and groundwater storage would change under the No Action Alternative, Delta inflow and outflow most likely would be similar to flows under existing conditions. Operations rules and demands, similar under both the No Action Alternative and existing conditions, would limit the ability to change flow patterns and the associated salinity distribution in the Delta. Consequently, the quantity and quality of wetlands and riparian vegetation in the Delta would not change appreciably. Changes that could occur are not quantifiable at a programmatic level of analysis.

Sediment supply and movement could be affected by actions upstream of the Delta, including the Sacramento River Flood Control Project (SRFCP). No anticipated project would substantially change the structure of the existing ecosystem, and changes in sediment supply and movement most likely would be minimal. Any changes in the quantity or quality of habitat could not be quantified at this programmatic level of analysis.

Contaminant input and movement could be reduced by restoration associated with the Stone Lakes National Wildlife Refuge (NWR). Contaminant input under the 2020 level of development could increase or decrease, however, and could negate any reduction attributable to restoration. Relative to existing sources of contaminants, the change in contaminant input most likely would be small. Changes in flow also could affect the movement and dilution of contaminants; however, information on flow change was unavailable.

Relative to existing conditions, projects under the No Action Alternative that could increase biological productivity, and nutrient input and movement in the terrestrial ecosystem include changes in wildlife refuge operations, and restoration associated with the Stone Lakes NWR and SRFCP. Restoration of riparian, shaded riverine aquatic (SRA), and tidal marsh areas could slightly increase productivity through increased production and input of organic carbon, providing a small benefit to Delta species.

Structural characteristics of the Delta would be similar for the No Action Alternative and existing conditions. The Stone Lakes NWR could affect structural characteristics of the Delta ecosystem and species habitat. Changes in structural characteristics are considered beneficial when the change moves toward a natural condition. Restoration of tidal marsh and connecting sloughs in Stone Lakes NWR and changes in levee maintenance practices to allow development of natural riparian and marsh communities would result in a small

Impact	Region	Alternative 1 Configurations		Alternative 2 Configurations				Alternative 3 Configurations			
		A & B	C	A	B	D	E	A	B & E	H	I
Ecosystem Restoration, Water Quality, Water Use Efficiency, and Levee System Integrity Programs: Habitat Area, Quality, and Pattern											
Loss or degradation of wetland and riparian communities	Delta	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS
	Bay	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS
	Sacramento River	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS
	San Joaquin River	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS
Loss or degradation of important wildlife habitats and use areas	Delta	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS
	Bay	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS
	Sacramento River	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS
	San Joaquin River	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS
Increase or improvement of wetland and riparian communities	Delta	B	B	B	B	B	B	B	B	B	B
	Bay	B	B	B	B	B	B	B	B	B	B
	Sacramento River	B	B	B	B	B	B	B	B	B	B
	San Joaquin River	B	B	B	B	B	B	B	B	B	B
Increase or improvement of upland habitats	Delta	B	B	B	B	B	B	B	B	B	B
	Bay	B	B	B	B	B	B	B	B	B	B
	Sacramento River										
	San Joaquin River										
Ecosystem Restoration, Water Quality, Water Use Efficiency, and Levee System Integrity Programs: Special-Status Species											
Loss of foraging habitat for special-status species	Delta	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS
	Bay	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS
	Sacramento River	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS
	San Joaquin River	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS
Loss of rare natural communities and significant natural areas	Delta	PS	PS	PS	PS	PS	PS	PS	PS	PS	PS
	Bay										
	Sacramento River										
	San Joaquin River										
Increase in habitat for special-status species	Delta	B	B	B	B	B	B	B	B	B	B
	Bay	B	B	B	B	B	B	B	B	B	B
	Sacramento River	B	B	B	B	B	B	B	B	B	B
	San Joaquin River	B	B	B	B	B	B	B	B	B	B
Expansion of rare natural communities and significant natural areas	Delta	B	B	B	B	B	B	B	B	B	B
	Bay	B	B	B	B	B	B	B	B	B	B
	Sacramento River	B	B	B	B	B	B	B	B	B	B
	San Joaquin River	B	B	B	B	B	B	B	B	B	B

**Table 1. Summary of Potentially Significant Impacts and Benefits of CALFED Alternatives by Region**

Impact	Region	Alternative 1 Configurations		Alternative 2 Configurations				Alternative 3 Configurations			
		A & B	C	A	B	D	E	A	B & E	H	I
Storage Facilities: Habitat Area, Quality, and Pattern											
Loss or degradation of wetland and riparian communities	Delta								PS		PS
	Bay										
	Sacramento River		PS		PS		PS		PS	PS	PS
	San Joaquin River		PS		PS	PS	PS		PS	PS	PS
Loss or degradation of important wildlife habitats and use areas	Delta								PS		PS
	Bay										
	Sacramento River		PS		PS		PS		PS	PS	PS
	San Joaquin River		PS		PS	PS	PS		PS	PS	PS
Increase or improvement of wetland and riparian communities	Delta								B		B
	Bay										
	Sacramento River		B						B	B	B
	San Joaquin River		B						B	B	B
Increase or improvement of upland habitats	Delta										
	Bay										
	Sacramento River				B		B				
	San Joaquin River				B	B	B				
Storage Facilities: Special-Status Species											
Loss of foraging habitat for special-status species	Delta								PS		PS
	Bay										
	Sacramento River				PS		PS		PS	PS	PS
	San Joaquin River		PS		PS		PS		PS	PS	PS
Loss of rare natural communities and significant natural areas	Delta								PS		PS
	Bay										
	Sacramento River		PS		PS		PS		PS	PS	PS
	San Joaquin River		PS		PS		PS		PS	PS	PS
Increase in habitat for special-status species	Delta								B		B
	Bay										
	Sacramento River		B		B		B		B	B	B
	San Joaquin River		B		B		B		B	B	B

**Table 1. Summary of Potentially Significant Impacts and Benefits of CALFED Alternatives by Region (Continued)**

Impact	Region	Alternative 1 Configurations		Alternative 2 Configurations				Alternative 3 Configurations			
		A & B	C	A	B	D	E	A	B & E	H	I
Conveyance Facilities: Habitat Area, Quality, and Pattern											
Loss or degradation of wetland and riparian communities	Delta		PS	PS	PS	PS	PS	PS	PS	PS	PS
	Bay										
	Sacramento River										
	San Joaquin River										
Loss or degradation of important wildlife and use areas	Delta		PS	PS	PS	PS	PS	PS	PS	PS	PS
	Bay										
	Sacramento River										
	San Joaquin River										
Increase or improvement of wetland and riparian communities	Delta		B	B	B	B	B	B	B	B	B
	Bay										
	Sacramento River										
	San Joaquin River										
Increase or improvement of upland habitats	Delta		B								
	Bay										
	Sacramento River										
	San Joaquin River										
Conveyance Facilities: Special-Status Species											
Loss of foraging habitat for special-status species	Delta							PS	PS	PS	PS
	Bay										
	Sacramento River										
	San Joaquin River										
Loss of rare natural communities and significant natural areas	Delta		PS	PS	PS	PS	PS	PS	PS	PS	PS
	Bay										
	Sacramento River										
	San Joaquin River										
NOTES:											
B = Beneficial impact.											
PS = Potentially significant adverse impact.											
Blank = No impact or minor impact.											

**Table 1. Summary of Potentially Significant Impacts and Benefits of CALFED Alternatives by Region (Continued)**

Habitat or Plant Community	Delta Region	Bay Region	Sacramento River Region	San Joaquin River Region
Open water	X	X	X	X
Wetlands <sup>a</sup>	X	X	X	X
Valley foothill riparian	X	X	X	X
Montane riparian			X	
Grassland	X	X	X	X
Valley foothill woodland			X	X
Montane hardwood			X	
Chaparral			X	
Mixed hardwood conifer			X	
Ponderosa pine			X	
Agricultural lands	X	X	X	X
NOTES:				
X = Potentially significant impact.				
Blank = No impact or minor impact.				
<sup>a</sup> Includes saline emergent wetland, freshwater emergent wetland, and seasonal wetland communities.				

**Table 2. Habitats and Plant Communities Potentially Affected by the CALFED Alternatives**

beneficial effect relative to the existing Delta system. For example, an additional 1,300 acres of habitat added to Stone Lakes NWR under the No Action Alternative would benefit several plant communities (including wetlands) by assisting the recovery of special-status species and increasing linkage between refuge habitats.

Current trends in agricultural crop mixes in the Delta and Sacramento River regions are resulting in more permanent crops, such as vineyards and orchards, and fewer "wildlife-conducive" crops, such as alfalfa; pasture; and, to some extent, rice. These trends probably would continue under the No Action Alternative and could adversely affect vegetation and wildlife. In addition, the improved irrigation efficiency occurring throughout the valley (although not to the extent anticipated under CALFED alternatives) has resulted in the loss of some incidental wetland and riparian habitat areas.

## **BAY REGION**

Under the No Action Alternative, effects on vegetation and wildlife communities in the Bay Region primarily would depend on the movement of contaminants, sediment, nutrients, and production from the Delta Region. The small increase in productivity and nutrient input identified for the Delta could be transported to the Bay and could provide minor benefits to the wetlands and adjacent upland habitats surrounding waters in the Bay Region.

## **SACRAMENTO RIVER REGION**

Differences between the No Action Alternative and existing conditions primarily would be due to flow changes. Although operations and surface water and groundwater storage would change under the No Action Alternative, Sacramento River and tributary flows most

Criterion, Assumption, or Project	Change from Existing Conditions				
	Flow	Diversion	Storage	Water Quality	Habitat
2020 level of development	X	X	X		
Increase CVP demands	X	X	X		
Increase SWP demands	X	X	X		
Refuge demands: Change from Level II to Level IV	X	X	X		X
Mokelumne River flow	X	X	X		
Land retirement: 45,000 acres	X	X	X	X	X
Coastal aqueduct	X	X	X		X
CVPIA (partial)	X	X	X		X
Kern Water Bank	X	X	X		X
Los Vaqueros Reservoir Project	X	X	X		X
MWD Eastside Reservoir Project	X	X	X		X
MWD Inland Feeder Project					
New Melones conveyance	X	X	X		X
Sacramento River Flood Control Project					X
Semitropic groundwater banking	X	X	X		X
Shasta temperature control				X	
Stone Lakes National Wildlife Refuge					X
NOTES:					
CVPIA = Central Valley Project Improvement Act.					
MWD = Metropolitan Water District.					
Assumes no new endangered species listings.					

**Table 3. Major Features of the No Action Alternative Relative to Existing Conditions**

likely would be similar to flows under existing conditions. Operations rules and demands, similar under both the No Action Alternative and existing conditions, would limit the ability to change flow patterns. Changes to the quality and quantity of riparian and wetland communities would be small and not measurable at a programmatic level of analysis.

The SRFCP could affect structural characteristics of the Sacramento and American

ivers, resulting in benefits if changes move toward a more natural condition. Changes in levee maintenance practices to allow development of natural riparian and SRA communities would result in small beneficial impacts relative to the existing levee system. Structural changes could result in a slight increase in quantity and quality of habitats supporting species (including special-status species) associated with riparian and SRA habitats.

## SAN JOAQUIN RIVER REGION

As discussed for the Sacramento River, flows would change between the No Action Alternative and existing conditions. San Joaquin River and tributary flows most likely would be similar to flows under existing conditions. Mokelumne and Tuolumne river flows could be altered to improve spawning and rearing conditions, providing a beneficial impact primarily on chinook salmon and possibly small benefits to riparian vegetation. The New Melones Conveyance Project could reduce water available for release down the Stanislaus River, adversely affecting flow conditions and possibly riparian vegetation.

Water quality conditions in most rivers in the San Joaquin River Region under the No Action Alternative would be similar to those for existing conditions. Most likely, 45,000 acres of agricultural land would be retired in the San Joaquin River Region. Land retirement could reduce input of contaminants (primarily selenium and salts) to the San Joaquin River and beneficially affect plant and animal species that obtain materials and food supply from areas currently affected by contaminants.

The water supplied to three NWRs, four wildlife management areas, and private wetlands in the Grasslands Water District would be at Level 4 under the No Action Alternative. Level 4, the amount of water required for full development of land lying within the 1988 refuge boundaries, contrasts with Level 2 under existing conditions, which is the average amount of water the refuges have received for approximately 10 years. In general, Level 4 water supplies would allow for greater flexibility and consistency in providing water for full development of wetlands, and water to support waterfowl and other species relying on refuge habitat. The increasing quantity and quality of habitat supported by Level 4 water supplies are not quantifiable at a programmatic level of detail.

## SWP AND CVP SERVICE AREAS OUTSIDE THE CENTRAL VALLEY

Impacts of the 2020 level of development on upland, wetland, and riparian habitat in the SWP and CVP Service Areas Outside the Central Valley could not be quantified with available information.

In general, the projects proposed would consist of new water conveyance (Coastal Aqueduct), water storage (Metropolitan Water District's Eastside Reservoir Project), and groundwater storage and groundwater recharge. Projects such as the Eastside Reservoir Project would displace up to 4,500 acres of habitat but would support smaller acreages of wetlands bordering the reservoir. Groundwater storage and recharge projects would remove terrestrial habitat for conveyance groundwater wells and pumps but could provide benefits to vegetation communities able to tap groundwater, particularly near springs. Groundwater recharge involving spreading basins would add open-water habitat and small wetland areas that could be used by waterfowl and other species.

### ***Comparison of CALFED Alternatives to No Action Alternative***

## DELTA REGION

Table 4 summarizes potentially significant impacts and benefits in the Delta Region. Table 5 summarizes the number of wildlife species that could be adversely or beneficially affected from decreases or increases in the area or quality of open-water, wetland, riparian, grassland, and agricultural habitats. Table 6 summarizes the acreage that could be affected from implementation of the Ecosystem

CALFED Program	Impact Category	Impact/Benefit	No Action Alternative	Alternative 1			Alternative 2				Alternative 3				
				A	B	C	A	B	D	E	A	B	E	H	I
Ecosystem Restoration, Water Quality, Water Use Efficiency, and Levee System Integrity	Habitat Area and Associated Wildlife	Temporary loss or disturbance of wetland and riparian communities		-	-	-	-	-	-	-	-	-	-	-	-
		Permanent loss of wetland and riparian communities		--	--	--	--	--	--	--	--	--	--	--	--
		Temporary loss or disturbance of wintering waterfowl foraging habitat		-	-	-	-	-	-	-	-	-	-	-	-
		Permanent loss of wintering waterfowl foraging habitat		--	--	--	--	--	--	--	--	--	--	--	--
		Increase in open-water and wetland communities		++	++	++	++	++	++	++	++	++	++	++	++
		Increase in riparian communities		++	++	++	++	++	++	++	++	++	++	++	++
		Protection of existing wetland and riparian communities		++	++	++	++	++	++	++	++	++	++	++	++
	Habitat Quality and Pattern	Potential for increased incidence of waterfowl disease		--	--	--	--	--	--	--	--	--	--	--	--
		Temporary fragmentation of riparian habitats		-	-	-	-	-	-	-	-	-	-	-	-
		Permanent fragmentation of riparian habitats		--	--	--	--	--	--	--	--	--	--	--	--
		Improved wetland habitat quality		++	++	++	++	++	++	++	++	++	++	++	++
		Improved riparian habitat quality		++	++	++	++	++	++	++	++	++	++	++	++
		Reduction in nonnative invasive plant abundance		++	++	++	++	++	++	++	++	++	++	++	++
		Improved habitat patterns		++	++	++	++	++	++	++	++	++	++	++	++
		Improved connectivity of riparian habitat		++	++	++	++	++	++	++	++	++	++	++	++
	Special-Status Species and Communities	Loss of foraging habitat for special-status species		-	-	-	-	-	-	-	-	-	-	-	-
		Loss of portions of rare natural communities and significant natural areas		-	-	-	-	-	-	-	-	-	-	-	-
		Increase in habitats for special-status species		++	++	++	++	++	++	++	++	++	++	++	++
		Expansion of rare natural communities and significant natural areas		++	++	++	++	++	++	++	++	++	++	++	++

Table 4. Summary of Potentially Significant Impacts and Benefits in the Delta Region



CALFED Program	Impact Category	Impact/Benefit	No Action Alternative	Alternative 1			Alternative 2				Alternative 3				
				A	B	C	A	B	D	E	A	B	E	H	I
Conveyance	Habitat Area and Associated Wildlife	Temporary loss or disturbance of wetland and riparian communities		0	-	-	-	-	-	-	-	-	-	-	-
		Permanent loss of wetland and riparian communities		0	-	-	-	-	--	--	-	-	-	--	-
		Temporary loss or disturbance of wintering waterfowl foraging habitat		0	-	-	-	-	-	-	-	-	-	-	-
		Permanent loss of wintering waterfowl foraging habitat		0	-	-	-	-	--	--	-	-	-	--	-
		Increase in open-water and wetland communities		0	0	0	+	+	++	++	+	+	+	++	+
		Increase in riparian communities		0	0	0	+	+	++	++	+	+	+	++	+
		Protection of existing wetland and riparian communities		0	0	0	0	0	0	0	0	0	0	0	0
	Habitat Quality and Pattern	Potential for increased incidence of waterfowl disease		0	0	0	0	0	0	0	0	0	0	0	0
		Temporary fragmentation of riparian habitats		0	-	-	-	-	-	-	-	-	-	-	-
		Permanent fragmentation of riparian habitats		0	-	-	-	-	--	--	-	-	-	--	-
		Improved wetland habitat quality		0	0	0	0	0	0	0	0	0	0	0	0
		Improved riparian habitat quality		0	0	0	0	0	0	0	0	0	0	0	0
		Reduction in nonnative invasive plant abundance		0	0	0	0	0	0	0	0	0	0	0	0
		Improved habitat patterns		0	0	+	+	+	++	++	+	+	+	++	+
		Improved connectivity of riparian habitat		0	0	+	+	+	++	++	+	+	+	++	+
	Special-Status Species and Communities	Loss of foraging habitat for special-status species		0	0	0	0	0	0	0	-	-	-	-	-
		Loss of portions of rare natural communities and significant natural areas		0	-	-	-	-	-	-	-	-	-	-	-
		Increase in habitats for special-status species		0	0	0	0	0	0	0	0	0	0	0	0
		Expansion of rare natural communities and significant natural areas		0	0	0	0	0	0	0	0	0	0	0	0

Table 4. Summary of Potentially Significant Impacts and Benefits in the Delta Region (Continued)

CALFED Program	Impact Category	Impact/Benefit	No Action Alternative	Alternative 1			Alternative 2				Alternative 3				
				A	B	C	A	B	D	E	A	B	E	H	I
Storage	Habitat Area and Associated Wildlife	Temporary loss or disturbance of wetland and riparian communities		0	0	0	0	0	0	0	0	-	-	0	-
		Permanent loss of wetland and riparian communities		0	0	0	0	0	0	0	0	--	--	0	--
		Temporary loss or disturbance of wintering waterfowl foraging habitat		0	0	0	0	0	0	0	0	-	-	0	-
		Permanent loss of wintering waterfowl foraging habitat		0	0	0	0	0	0	0	0	--	--	0	--
		Increase in open-water and wetland communities		0	0	0	0	0	0	0	0	++	++	0	++
		Increase in riparian communities		0	0	0	0	0	0	0	0	++	++	0	++
		Protection of existing wetland and riparian communities		0	0	0	0	0	0	0	0	0	0	0	0
	Habitat Quality and Pattern	Potential for increased incidence of waterfowl disease		0	0	0	0	0	0	0	0	--	--	0	--
		Temporary fragmentation of riparian habitats		0	0	0	0	0	0	0	0	-	-	0	-
		Permanent fragmentation of riparian habitats		0	0	0	0	0	0	0	0	--	--	0	--
		Improved wetland habitat quality		0	0	0	0	0	0	0	0	0	0	0	0
		Improved riparian habitat quality		0	0	0	0	0	0	0	0	0	0	0	0
		Reduction in nonnative invasive plant abundance		0	0	0	0	0	0	0	0	0	0	0	0
		Improved habitat patterns		0	0	0	0	0	0	0	0	0	0	0	0
		Improved connectivity of riparian habitat		0	0	0	0	0	0	0	0	0	0	0	0
	Special-Status Species and Communities	Loss of foraging habitat for special-status species		0	0	0	0	0	0	0	0	-	-	0	-
		Loss of portions of rare natural communities and significant natural areas		0	0	0	0	0	0	0	0	-	-	0	-
		Increase in habitats for special-status species		0	0	0	0	0	0	0	0	+	+	0	0
		Expansion of rare natural communities and significant natural areas		0	0	0	0	0	0	0	0	0	0	0	0

NOTE:  
- or + indicates a relative adverse (-) or beneficial (+) impact. The larger number of symbols represents a greater degree of change in habitat acres.

Table 4. Summary of Potentially Significant Impacts and Benefits in the Delta Region (Continued)

C-009216

Habitat Type	Number of Associated Wildlife Species
Open water <sup>a</sup>	46
<b>Wetlands</b>	
Seasonal wetlands <sup>b</sup>	71
Saline emergent wetlands <sup>c</sup>	54
Freshwater emergent wetlands <sup>d</sup>	<u>73</u>
<b>Wetlands subtotal</b>	<b>113</b>
Valley foothill riparian	137
Grassland	82
Agricultural lands <sup>e</sup>	119
NOTES:	
Numbers of species determined from Table S-1 in the Supplement.	
<sup>a</sup> Includes species listed in Supplement under deep open-water and shallow open-water habitats.	
<sup>b</sup> Includes species listed in Supplement under agriculture-wetland and mudflat (nontidal species only) habitats.	
<sup>c</sup> Includes species listed in Supplement under saline emergent wetland and mudflat habitats.	
<sup>d</sup> Includes species listed in Supplement under freshwater emergent wetland and mudflat habitats.	
<sup>e</sup> Includes species listed in Supplement under agriculture-wetland and agriculture-upland habitats.	

**Table 5. Number of Wildlife Species Associated with Habitat Types Potentially Created, Improved, or Affected under All Alternatives in the Delta Region**

Configurations	Ecosystem Restoration Program	Levee Improvements	Storage Facilities	Conveyance Facilities
1A	105,000 - 135,000	12,000 - 13,000	0	0
1B	105,000 - 135,000	12,000 - 13,000	0	100
1C	105,000 - 135,000	12,000 - 13,000	0	400
2A	105,000 - 135,000	12,000 - 13,000	0	4,000 - 4,500
2B	105,000 - 135,000	12,000 - 13,000	0	4,000 - 4,500
2D	105,000 - 135,000	12,000 - 13,000	0	18,000 - 22,500
2	105,000 - 135,000	12,000 - 13,000	0	25,200 - 30,000
3A	105,000 - 135,000	12,000 - 13,000	0	4,500 - 6,000
3B	105,000 - 135,000	12,000 - 13,000	14,000 - 15,000	4,500 - 6,000
3	105,000 - 135,000	12,000 - 13,000	14,000 - 15,000	5,000 - 5,500
3H	105,000 - 135,000	12,000 - 13,000	0	29,000 - 33,500
3I	105,000 - 135,000	12,000 - 13,000	4,000 - 4,500	7,000 - 9,000

**Table 6. Footprint of CALFED Alternatives in the Delta Region (in acres)**

Restoration Program, Levee System Integrity Program, and Storage and Conveyance for all configurations. Table 7 lists the potential occurrence of special-status species that could be affected in the Delta Region by habitat type.

### **ALTERNATIVE 1**

Diversions under Alternative 1, including conveyance and discharge, may change relative to the No Action Alternative and existing conditions. Diversions also would be different under all three configurations because of changes in the export facilities for Configurations 1B and 1C.

The program actions called for under Alternative 1 would involve substantial changes in the disposition of land and water resources throughout the Bay-Delta river system. Substantial amounts of agricultural land currently protected by levees would be converted to aquatic habitat (permanently wetted acreage), emergent wetland, or periodically flooded riparian acreage. Additional high spring flow would be allowed to pass down the rivers and through the Delta without being stored, diverted, or exported. A greater proportion of the water being diverted or exported from the system would pass through fish screens; the toxicant load entering the system from agricultural acreage, abandoned mines, industrial facilities, and other sources would be substantially reduced; and a large-scale effort to control the spread of water hyacinth and other invasive non-native plant species would be undertaken.

Discussion of each of the programs is addressed first for plant communities and wildlife, and then for special-status species and communities. To avoid redundancy, when impacts are the same as under Configuration 1A, they are not discussed again.

### **Configuration 1A**

Except as noted, adverse and beneficial impacts of implementing all programs in the Delta Region are the same under all configurations as described for Configuration 1A. Except as noted, descriptions of wildlife values associated with each habitat type that could be affected by Configuration 1A are the same for other CALFED regions for all configurations where these habitat types are present.

### ***Ecosystem Restoration Program***

It is important to note that many of the benefits that would result from implementation of CALFED would be directly attributable to the Ecosystem Restoration Program. This program was designed to restore and enhance thousands of acres of habitat in the Delta and other geographic regions, which would result in an overall positive habitat gain for each of the regions, considering adverse and beneficial impacts. This concept of overall benefit does not imply that Ecosystem Restoration Program restoration activities would mitigate habitat losses that resulted from actions associated with the other programs. Each potentially significant adverse impact identified would require mitigation to compensate for or avoid adverse impacts. Mitigation strategies presented in this programmatic document are conceptual. Final mitigation measures would need to be approved by responsible agencies when subsequent environmental review was conducted for specific projects. The Ecosystem Restoration Program therefore may provide benefits above and beyond mitigations proposed for adverse impacts resulting from CALFED actions.

Species Common Name	Valley-Foothill Riparian	Inland Dunes	Grassland	Freshwater Emergent Marsh	Saline Emergent Marsh	Aquatic	Agricultural
<b>Animals</b>							
<i>Ambystoma californiense</i> California tiger salamander			X			X	
<i>Anthicus sacramento</i> Sacramento anthicid beetle		X					
<i>Apodemia mormo langei</i> Lange's metalmark butterfly		X					
<i>Archoplites interruptus</i> Sacramento perch						X	
<i>Buteo swainsoni</i> Swainson's hawk	X						X
<i>Clemmys marmorata marmorata</i> Northwestern pond turtle				X		X	
<i>Coelus gracilis</i> San Joaquin dune beetle		X					
<i>Desmocerus californicus dimorphus</i> Valley elderberry longhorn beetle	X						
<i>Grus canadensis tabida</i> Greater sandhill crane			X				X
<i>Hygrotus curvipes</i> Curved-foot hygrotus diving beetle						X	
<i>Laterallus jamaicensis coturniculus</i> California black rail				X	X		
<i>Lytta molesta</i> Molestan blister beetle			X				
<i>Thamnophis gigas</i> Giant garter snake				X		X	X
<i>Vulpes macrotis mutica</i> San Joaquin kit fox			X				
<b>Plants</b>							
<i>Aster lentus</i> Suisun marsh aster				X	X		

Table 7. Potential Occurrence of Special-Status Species by General Habitat Type in the Delta Region

Species Common Name	Valley-Foothill Riparian	Inland Dunes	Grassland	Freshwater Emergent Marsh	Saline Emergent Marsh	Aquatic	Agricultural
<i>Astragalus tener</i> var. <i>tener</i> Alkali milk-vetch			X				
<i>Atriplex cordulata</i> Heartscale			X				
<i>Atriplex depressa</i> Brittlescale			X				
<i>Atriplex joaquiniana</i> San Joaquin saltbus			X				
<i>Carex comosa</i> Bristly sedge				X			
<i>Cirsium crassicaule</i> Slough thistle	X			X			
<i>Cordylanthus mollis</i> ssp. <i>hispidus</i> Hispid bird's beak			X				
<i>Delphinium recurvatum</i> Recurved larkspur			X				
<i>Erysimum capitatum</i> ssp. <i>angustatum</i> Contra Costa wallflower		X					
<i>Hibiscus lasiocarpus</i> California hibiscus	X			X			
<i>Juglans hindsii</i> Northern California black walnut	X						
<i>Lathyrus jepsonii</i> var. <i>jepsonii</i> Delta tule pea				X	X		
<i>Lepidium latipes</i> var. <i>heckardii</i> Heckard's pepper-grass			X				
<i>Lilaeopsis masonii</i> Mason's lilaeopsis	X			X	X		
<i>Limosella subulata</i> Delta mudwort	X			X	X		
<i>Madia radiata</i> Showy madia			X				

Table 7. Potential Occurrence of Special-Status Species by General Habitat Type in the Delta Region (Continued)

Species Common Name	Valley-Foothill Riparian	Inland Dunes	Grassland	Freshwater Emergent Marsh	Saline Emergent Marsh	Aquatic	Agricultural
<i>Oenothera deltoides</i> ssp. <i>howellii</i> Antioch Dunes evening primrose		X					
<i>Scutellaria galericulata</i> Marsh skullcap				X	X		
<i>Tropidocarpum capparideum</i> Caper-fruited tropidocarpum			X				

**Table 7. Potential Occurrence of Special-Status Species by General Habitat Type in the Delta Region (Continued)**

C-009221

## Plant Communities and Associated Wildlife

Under Configuration 1A, restoration identified for the south Delta would be relocated to the north and west Delta to avoid the south Delta pumping facilities. In the Delta Region, implementation of the Ecosystem Restoration Program would:

- Create or restore the following natural plant community types: 30,000 to 45,000 acres of tidal freshwater emergent wetland; up to 17,000 acres of nontidal freshwater emergent wetland; 900 to 2,300 acres of tidally influenced channels and distributary sloughs; up to 7,000 acres of shallow-water habitat; up to 500 acres of shoals; 500 acres of open-water areas within restored freshwater emergent wetland areas; 1,500 to 2,000 acres of shallow open-water areas within restored freshwater emergent wetland areas; up to 30,000 acres of seasonal wetlands; 700 to 8,000 acres of riparian habitat; and 180 to 720 acres of channel islands.
- Protect 500 to 1,000 acres of vernal pools and adjacent buffer lands; protect 500 acres of existing riparian woodland; protect and enhance 20 to 80 acres of channel islands; enhance up to 4,000 acres of seasonal wetland; and cooperatively manage 40,000 to 75,000 acres of agriculture lands, in order to improve habitat values for waterfowl and other wildlife.

Most habitats would be restored on existing agricultural lands, and relatively small acreages of some natural plant communities would be lost or converted to open-water or other natural plant communities.

Existing natural terrestrial communities (such as grassland and ruderal habitats) would be affected by restoration of shallow-water, wetland, and riparian habitats. Affected communities generally would be dominated by exotic grasses and forbs, and typically would be

associated with levee slopes and abandoned agricultural lands. Direct impacts on these habitats would result from construction of levee setbacks and breaching or removal of levees to restore shallow-water, wetland, and riparian habitats. Indirect impacts associated with these actions may include changes in hydrology (flooding Delta islands) that would result in converting uplands to wetlands. Losses of grassland and ruderal habitats would be partially or completely offset by natural reestablishment of herbaceous vegetation on setback levees and along higher elevation margins of restored wetland and riparian habitats that are not farmed.

Other actions that would affect grassland and ruderal habitats may include altering existing vegetation management practices on levees to encourage natural reestablishment of riparian vegetation and control of exotic plant species that compete with native plants in existing habitat areas. The area of habitat affected by these actions could not be estimated because the area to be treated was unknown and the success of treatments was expected to vary among treated locations. The quality of grassland and ruderal habitats in areas treated to control exotic plant species would increase, because treated habitats would become increasingly dominated by native plants as a result of reducing competition with exotic species.

Changes in the area, quality, and pattern of grassland and ruderal habitats would be too small to substantially affect the distribution or number of associated wildlife.

Because the type of riparian community that would be restored depends on site-specific conditions, such as local hydrology and soils, the area of each type of riparian community that would be restored could not be predicted. In some portions of the Delta, existing riparian scrub, woodland, and forest would be affected by restoration of shallow-water, wetland, and riparian habitats. Potentially affected riparian habitats typically would be associated with levee berms and shorelines along unleveed



channels. Direct impacts on these riparian habitats would result from construction of levee setbacks, and breaching or removal of levees to restore shallow-water, wetland, and riparian habitats, representing a temporary local reduction in the area supporting riparian communities.

Riparian plants that would benefit from restoration may include species currently present in the Delta, such as Fremont cottonwood, valley oak, western sycamore, white alder, box elder, blackberry, wild rose, and several willow tree and shrub species. Approximately 137 species of wildlife that are known to use riparian habitats in the Delta also would benefit from restoration of riparian habitats (Table 5).

Restoration of riparian corridors along Delta channels would increase the connectivity among existing fragmented riparian areas in the Delta. Establishment of more continuous habitat corridors would benefit wildlife, such as neotropical migrant birds, that require riparian vegetation for cover during migration or local movements, and would increase the potential for genetic interchange among currently isolated riparian wildlife populations. Similarly, restoration of habitat adjacent to existing riparian habitat areas would increase the quality of existing riparian habitats for riparian-associated wildlife. When compared to the No Action Alternative, restoration of riparian habitat in conjunction with shallow-water and wetland habitats also would restore a more historical pattern of habitats to the Delta, where these habitats would establish along an elevational gradient from open-water at lower elevations, gradually transitioning to wetland and then riparian habitat at higher elevations.

Restoration of habitat corridors of greater than the width typically present in the Delta would increase habitat area for species that require large, continuous tracts of habitat. Wider riparian corridors also would reduce the likelihood of nest parasitism on passerine birds by brown-headed cowbirds, which typically

parasitize nests along the edge of riparian habitats. The quality of existing riparian vegetation also would be increased as a result of modifying levee and berm maintenance practices, and controlling exotic plant species that compete with native plants. Modification of vegetation maintenance practices to allow riparian vegetation to attain greater maturity would increase foraging and cover value for associated wildlife. The quality of existing riparian habitats treated to control exotic plant species would increase because treated habitats would become increasingly dominated by native plants as a result of reducing competition with exotic species.

An unknown quantity of riparian vegetation also would naturally reestablish as a result of restoration of other habitat types. Riparian vegetation would be expected to establish along the margins of restored tidal slough, shallow-water, and wetland habitat areas where soil moisture conditions would be suitable to sustain riparian vegetation. Riparian vegetation also would establish on portions of restored mid-channel islands with suitable soil moisture. Existing riparian vegetation associated with mid-channel islands and Delta shorelines would be protected from future potential loss to erosion, as a result of reducing boat wake-induced erosion and protecting mid-channel islands from further erosion. The area of riparian vegetation also would increase as a result of modifying levee and berm vegetation maintenance practices to allow riparian vegetation to naturally reestablish in locations where its establishment currently is prevented.

In some portions of the Delta, existing wetland habitats would be affected by restoration of shallow-water, wetland, and riparian habitats. Affected wetlands would be primarily tidal freshwater emergent wetlands associated with shallow-water margins of sloughs and Delta channels. A temporary local reduction in wetland habitat acreage could result from construction of levee setbacks and breaching or removal of levees to restore shallow-water, wetland, and riparian habitats. Wetland

vegetation growing adjacent to the island side of levees also would be affected by construction of levee setbacks. The potential natural reestablishment of similar wetland vegetation along the island side of setback levees, however, would partially offset this impact. Nontidal freshwater emergent wetlands associated with island interiors, such as low-elevation sites that pond or maintain groundwater near the surface for a sufficient duration to support wetland vegetation, canals, and ditches, would be expanded in area and converted, depending on their location, to tidal shallow-water, wetland, or riparian habitat as a result of breaching levees to flood islands.

Restoration of large areas of tidal shallow open-water habitat would benefit wildlife species that forage or rest in shallow-water habitats. Shallow-water areas of the Delta typically attract small fish that provide forage for grebes, herons, terns, and other fish-eating wildlife. An unpredictable quantity of sparsely or unvegetated tideflats would be created from restoring shallow-water habitats at elevations that are exposed during low tides but are sufficiently inundated during other periods to preclude establishment of emergent vegetation. Tideflats are important foraging and resting habitats for shorebirds that migrate through or winter in the Delta.

Deep and shallow open-water areas also would be restored, in addition to nontidal fresh emergent marsh. These open-water areas enhance the wildlife value of associated emergent vegetation by providing wildlife access to otherwise densely vegetated habitat. Open-water habitats also provide brood habitat for ducks and other waterbirds that breed in the Delta; and forage and resting habitat for waterfowl, grebes, terns, and other Delta species that use open water.

Large tracts of tidal emergent wetland would be restored by breaching levees to flood Delta islands and setting back levees. Some wetlands also would become established as a result of restoration of mid-channel islands. Tidal

freshwater emergent wetlands provide foraging and nesting habitat for waterfowl and other waterbirds, rails, herons and egrets, marsh wrens, several species of blackbirds, and other wetland-associated species. Proposed actions to reduce or eliminate erosion of existing mid-channel islands also would protect associated freshwater emergent wetland vegetation from future loss to erosion. Nontidal freshwater emergent wetlands would be restored on the interior of Delta islands and would provide wildlife habitat value similar to that described for tidal freshwater emergent wetland.

Restoration of tidal sloughs would result in establishment of deep and shallow open-water, tideflat, and freshwater emergent wetland habitats. The area of each habitat type that would be restored would depend on local site conditions.

Restoration of large tracts of seasonal wetlands throughout the Delta would provide foraging and resting habitat for many species of wildlife. During winter, flooded seasonal wetlands would provide foraging and resting habitat for wintering waterfowl, wintering and migrant shorebirds, and other waterbirds. Habitat quality would be increased on approximately 1,000 acres of existing seasonal wetlands in the Yolo Bypass, by improving land and water management practices. Mudflats that would be exposed as water levels receded during spring would provide foraging habitat for migrant shorebirds. Unflooded seasonal wetland vegetation would provide nesting habitat for ground-nesting birds, such as the mallard and ring-necked pheasant, and foraging habitat for raptors.

Overall, restoration and enhancement of these habitats would substantially increase available waterfowl breeding, foraging, and resting habitat for waterfowl in the Delta compared to the No Action Alternative. Under the No Action Alternative, suitable duck nesting and breeding habitat would be limited in the Delta. Restoration of wetlands in conjunction with open-water habitat would increase the area of

suitable nesting and breeding habitat, and potentially substantially increase the number of ducks annually produced in the Delta.

Restoration of tidal emerging wetland and shallow-water habitat, seasonal wetlands, and associated mudflats and tideflats would substantially increase the availability of foraging and resting habitat for migrant and wintering shorebirds in the Delta compared to the No Action Alternative.

As described for restoration of riparian habitat, restoration of wetlands would restore a more historical pattern of open-water, wetland, and riparian habitat areas in the Delta. Restoration of large tracts of wetlands among existing agricultural lands also would create a habitat pattern that potentially would result in a more uniform distribution in the Delta of wildlife that breed or rest in wetlands and forage in agricultural habitats, by creating wetlands closer to agricultural lands.

Major agricultural land cover types include grain and hay crops, row crops, truck crops, pasture, and orchards and vineyards. Under Alternative 1, approximately up to 115,000 acres of shallow-water, wetland, and riparian habitat would be restored. Most of this habitat restoration would be implemented on agricultural lands. The impact of the loss of agricultural land on Delta wildlife depends on the affected cover type and agricultural land use practices. Approximately 119 wildlife species are known to use agricultural lands in the Delta (Table 5). Although agricultural lands provide important habitat for some species and species groups, the diversity of wildlife associated with any particular agricultural cover type is generally much lower than the diversity of wildlife associated with native habitats. Wildlife habitat values provided by agricultural lands also are limited by seasonal changes in habitat structure (harvested compared to unharvested fields or flooded compared to unflooded fields), frequent disturbances associated with farming (operation of farm equipment), use of pesticides, and clean farming

practices that eliminate habitat areas near field borders.

Compared to the No Action Alternative, the loss of large acreages of some cover types, such as cornfields, grainfields, and pasture, would result in a substantial loss of foraging habitat area for wintering waterfowl and sandhill cranes that depend on agricultural lands in the Delta during winter. Most agricultural crop types (asparagus and other truck crops, safflower, and orchards and vineyards) provide little or no forage value for wintering waterfowl and sandhill cranes. Agricultural lands restored to wetland habitats also would result in a substantial loss of forage and cover for wildlife species, such as ring-necked pheasant, mourning dove, red-tailed hawk, and California vole, that are dependent on upland habitats.

Fall through early spring flooding of agricultural lands, planting crops with high wildlife forage value, and leaving portions of high-value crop lands unharvested would substantially increase the forage value of treated lands for wintering waterfowl. Creating brood ponds, which are likely a major factor limiting the production of ducks in the Delta Region, could increase local duck populations, and benefit grebes and other waterbirds. Maintaining greater quantities of cover on unflooded lands would increase cover and forage values for upland species typically associated with agricultural lands, such as ring-necked pheasant.

### *Special-Status Species and Communities*

The shift from agricultural lands to natural plant communities in the Delta as a result of implementation of the Ecosystem Restoration Program probably would benefit many of the special-status species listed in Table 7. The number of species to benefit would depend on specific facility locations not known at this time. Although loss of agricultural lands initially could adversely affect the foraging areas of the Swainson's hawk, implementing the

Ecosystem Restoration Program would result in a net overall benefit, since the primary limiting factors for this species, nesting and roosting trees, would be increased by the Ecosystem Restoration Program.

Eleven rare natural communities and 29 significant natural areas are known or have the potential to occur in the Delta Region. Overall, the Ecosystem Restoration Program would positively affect these communities. Although construction activities would disturb some communities, such as disturbance of Great Valley willow scrub during construction of levee setbacks, a long-term gain is expected over the life of the project as the old levees are allowed to revegetate naturally. Impacts on and benefits to special-status species from Ecosystem Restoration Program implementation would be similar for Configurations 1B and 1C.

### ***Water Quality Program and Coordinated Watershed Management***

#### ***Plant Communities and Associated Wildlife***

Implementation of the Water Quality Program would reduce loadings of organic and inorganic constituents (metals and insecticides) to the Delta and its tributaries from mine drainage, urban and industrial runoff, wastewater and industrial discharge, and agricultural drainage. Loadings of these elements would be reduced through source control and treatment.

Implementation of these actions would be beneficial; however, the magnitude of benefits could not be predicted. Implementation of best management practices (BMPs) for application of insecticides could reduce drift to adjacent habitats. Reduction of insecticide drift would increase the availability of prey for species that feed on invertebrates and reduce the likelihood for bioaccumulation of compounds in the foodweb. Reduction in loadings of organic and inorganic constituents in the aquatic ecosystem would reduce bioaccumulation of these compounds in the Delta's foodweb and,

consequently, in wildlife that feed directly on aquatic organisms or on terrestrial organisms that feed on aquatic species. Sufficient reduction of toxins in the foodweb could result in greater reproductive success of wildlife species that potentially would be adversely affected by these compounds under the No Action Alternative.

Water Quality Program actions that may result in ground disturbance, such as relocating water intakes, could result in localized and temporary disturbance to riparian vegetation and associated wildlife in some locations.

Adverse and beneficial impacts of implementing the Water Quality Program in the Delta Region and other CALFED regions are the same for all configurations as described for Configuration 1A.

### ***Special-Status Species and Communities***

The Water Quality Program would improve water quality throughout the Delta by reducing mercury loadings, pesticide levels, and oxygen depletion. These improvements in water quality under Configuration 1A would benefit the 34 special-status species listed in Table 8 either directly, by improving the health of individuals of the species, or indirectly, by improving the quality of their habitat. Similarly, these water quality improvements are expected to positively affect the 11 rare communities and 29 significant natural areas in the Delta Region. The benefits from implementation of the Water Quality Program would be similar for all configurations.

Species Common Name	Status <sup>a</sup>			Alternative 1 Variations <sup>b</sup>			Alternative 2 Variations				Alternative 3 Variations				
	Fed. List	CA List	CNPS	A	B	C	A	B	D	E	A	B	E	H	I
<b>Animals</b>															
<i>Ambystoma californiense</i> California tiger salamander	SC	SC	--												
<i>Anthicus sacramento</i> Sacramento anthicid beetle	SC	--	--												
<i>Apodemia mormo langei</i> Lange's metalmark butterfly	E	--	--												
<i>Buteo swainsoni</i> Swainson's hawk	--	T	--		X	X	X	X	X	X	X	X	X	X	X
<i>Clemmys marmorata marmorata</i> Northwestern pond turtle	SC	--	--		X	X	X	X	X	X	X	X	X	X	X
<i>Coelus gracilis</i> San Joaquin dune beetle	C	--	--												
<i>Desmocerus californicus dimorphus</i> Valley elderberry longhorn beetle	T	--	--		(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
<i>Grus canadensis tabida</i> Greater sandhill crane	--	T	--		(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
<i>Hygrotus curvipes</i> Curved-foot hygrotus diving beetle	SC	--	--												
<i>Laterallus jamaicensis coturniculus</i> California black rail	--	T	--			X			X	X	X	X	X	X	X
<i>Lytta molesta</i> Molestan blister beetle	SC	--	--												
<i>Thamnophis gigas</i>	T	T	--		(+)	(+)	(+)	(+)	(+)	(+)	X	X	X	X	X
<i>Vulpes macrotis mutica</i> San Joaquin kit fox	E	T	--											X	
<b>Plants</b>															
<i>Aster lentus</i> Suisun marsh aster	SC	--	1B			X			X	X	(+)	(+)	(+)	X	(+)
<i>Astragalus tener</i> var. <i>tener</i> Alkali milk-vetch	--	--	1B												

Table 8. Special-Status Species Potentially Adversely Affected by Proposed Conveyance Facilities in the Delta Region

Species Common Name	Status <sup>a</sup>			Alternative 1 Variations <sup>b</sup>			Alternative 2 Variations				Alternative 3 Variations				
	Fed. List	CA List	CNPS	A	B	C	A	B	D	E	A	B	E	H	I
<i>Atriplex cordulata</i> Heartscale	SC	--	1B												
<i>Atriplex depressa</i> Brittlescale	--	--	1B												
<i>Atriplex joaquiniana</i> San Joaquin saltbush	SC	--	1B												
<i>Carex comosa</i> Bristly sedge	--	--	2								X	X	X	X	X
<i>Cirsium crassicaule</i> Slough thistle	SC	--	1B		(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)	(+)
<i>Delphinium recurvatum</i> Recurved larkspur	SC	--	1B												
<i>Erysimum capitatum</i> ssp. <i>angustatum</i> Contra Costa wallflower	E	E	1B												
<i>Hibiscus lasiocarpus</i> California hibiscus	--	--	2		X	X	X	X	X	X	X	X	X	X	X
<i>Juglans hindsii</i> Northern California black walnut	SC	--	1B		X	X	X	X	X	X	X	X	X	X	X
<i>Lathyrus jepsonii</i> var. <i>jepsonii</i> Delta tulle pea	SC	--	1B		X	X	X	X	X	X	X	X	X	X	
<i>Lilaeopsis masonii</i> Mason's lilaeopsis	SC	R	1B		X	X	X	X	X	X	X	X	X	X	X
<i>Limosella subulata</i> Delta mudwort	--	--	2		X	X	X	X	X	X	X	X	X	X	
<i>Oenothera deltoides</i> ssp. <i>howellii</i> Antioch Dunes evening primrose	E	E	1B												
<i>Scutellaria galericulata</i> Marsh skullcap	--	--	2												
<i>Tropidocarpum capparideum</i> Caper-fruited tropidocarpum	SC	--	1A		X	X	X	X	X	X	X	X		X	X
<b>Total special-status species</b>					12	14	12	12	14	14	15	15	14	16	13
Vernal pool landscape (acres) <sup>c</sup>	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0

Table 8. Special-Status Species Potentially Adversely Affected by Proposed Conveyance Facilities in the Delta Region (Continued)

**NOTES:****<sup>a</sup> Status abbreviations:****Federal (DFG 1997)**

E = Endangered.  
 T = Threatened.  
 C = Candidate.  
 SC = Species of concern.

**State (DFG 1997)**

E = Endangered.  
 T = Threatened.  
 SC = Species of concern.

**CNPS (Skinner and Pavlik 1994)**

1A = Presumed extinct.  
 1B = Species that are rare, threatened, or endangered throughout their range.  
 2 = Species that are rare, threatened, or endangered in California but more common elsewhere.

**<sup>b</sup>** Proposed actions considered under Alternative 1A would not directly affect wetland or terrestrial special-status species.

**<sup>c</sup>** Vernal pool special-status species landscape includes the watershed areas that support several of the species indicated in this table. The database used for estimating acres affected is Holland (1997), a more accurate database than California Department of Fish and Game's NDDB, which is used for evaluating presence of individual species.

**Symbols:**

X = A known occurrence of a species within conveyance facilities.  
 (+) = A presumed occurrence of a species based on the likely presence of suitable habitat.

**SOURCE:**

DFG 1997.

**Table 8. Special-Status Species Potentially Adversely Affected by Proposed Conveyance Facilities in the Delta Region (Continued)**

## ***Water Use Efficiency Program and Water Transfers***

### ***Plant Communities and Associated Wildlife***

Specific actions that could affect plant communities and associated wildlife were not identified for the Water Use Efficiency and Water Transfers program elements. Types of actions that could affect terrestrial resources under this program could include improving on-farm water use efficiency, changing to crops that require less water, and fallowing cropland. Improving on-farm water use efficiency could result in the loss of wetland, riparian, and other habitat areas currently supported by agricultural drainage. Cropping patterns could change if implementing efficiency programs resulted in increased water prices. Wildlife could be adversely affected if crops with relatively high wildlife habitat values were displaced by crops with lower wildlife habitat value. Fallowing croplands could have similar effects on vegetation and wildlife resources.

### ***Special-Status Species and Communities***

The Water Use Efficiency Program and Water Transfers program elements include programs with goals to reduce existing use and future demand on water supply. Some elements would be voluntary, and some are already in use or are planned as part of other programs; therefore, benefits that can be attributed to CALFED actions would be limited. To the extent that the Water Use Efficiency and Water Transfers reduces existing water use and future demand, more water could be left in Delta channels that would benefit or not adversely affect special-status species, rare natural communities, and significant natural areas.

## ***Levee System Integrity Program***

### ***Plant Communities and Associated Wildlife***

Impacts of implementing the Special Habitat Improvement Projects and Delta Island Subsidence Control Plan (elements of the Levee System Integrity Program) would be the same as the impacts described for Ecosystem Restoration Program restoration actions that would affect levees or flood Delta islands. Specific actions that could affect plant communities and associated wildlife were not identified for the Delta Levee Emergency Management Plan and Delta Levee Seismic Risk Assessment elements of the Levee System Integrity Program; therefore, the potential impacts of these program elements could not be determined.

The Delta Levee Base Level Protection Plan program element would upgrade approximately 1,100 miles of levees to Public Law (PL)-99 standards, including approximately 100 miles of setback levees. Implementation of the program would affect up to an estimated 13,000 acres of existing levee habitats. Approximately 75% of the existing levee area supports grassland and ruderal vegetation or largely unvegetated riprap, and 25% supports riparian vegetation. Increasing the landbase of levees would affect primarily agricultural land and some grassland adjacent to existing levees. Habitat values associated with grassland, ruderal, riparian, and agricultural habitats would be the same as described for the Ecosystem Restoration Program.

### ***Special-Status Species and Communities***

Many features of the Levee System Integrity Program that would result in increased natural habitat and are identified in the Ecosystem



Restoration Program. The goal of the Levee System Integrity Program is to reduce the risk of levee failure, which would further benefit the 19 special-status species that occur on inland dunes, grassland, and agricultural plant communities (Table 8), by protecting Delta lands within existing levees from flood damage. Impacts and benefits on special-status species and communities would be similar for all variations except Configuration 3I.

### ***Storage and Conveyance***

No new storage or conveyance facilities are planned for the Delta under Configuration 1A.

## **Configuration 1B**

### ***Storage and Conveyance***

#### ***Plant Communities and Associated Wildlife***

South Delta modifications under Storage and Conveyance would include direct impacts related to the construction of a barrier at the head of Old River, and flow and stage control facilities. Construction of new access roads, control buildings, and other facilities could remove and disturb natural communities, potentially including emergent wetland, riparian shrub and woodland, and grassland and ruderal vegetation. Specific acreages of habitats would depend on the specific design and location of facilities that would be constructed.

South Delta modifications potentially would result in the removal of up to 5 acres of emergent wetland and of up to 15 acres of riparian scrub and woodland, and potentially would affect up to 50 acres of ruderal vegetation. Depending on how it is operated, the barrier at the head of Old River could disrupt tidal flow sufficiently to result in the loss of tidal wetlands or a change in the plant species composition of wetlands upstream of the barrier.

Construction of an intertie between the Tracy Pumping Plant and Clifton Court Forebay potentially would affect emergent marsh,

riparian scrub and woodland, and grassland and ruderal vegetation. The amount of affected acres would depend on the location and design of the intertie.

Potentially affected common plant species would include Fremont cottonwood, willow species, western sycamore, blackberry, common tule, and cattails. Associated common wildlife species that potentially would be affected include emergent wetland wildlife, riparian wildlife, and grassland wildlife.

South Delta modifications would include direct impacts on agricultural lands related to the construction of a barrier at the head of Old River, and flow and stage control facilities. Construction of new access roads, control buildings and other facilities would remove agricultural communities, potentially including grain and hay crops, corn and sorghum, other row crops, truck crops, pasture, orchards and vineyards, and idled lands. The amount of affected acres would depend on the selected location of the facilities. Direct potential impacts of south Delta modifications were assumed to be removal of less than 50 acres of agricultural habitats.

Construction of an intertie between the Tracy Pumping Plant and Clifton Court Forebay potentially would affect agricultural habitat. The affected acreage would depend on the location and design of the intertie. Associated common wildlife that potentially would be affected would include agricultural wildlife.

#### ***Special-Status Species and Communities***

Storage and conveyance facilities in Configuration 1B could affect up to 12 special-status species, three rare natural communities, and five significant natural areas in the Delta Region.

## Configuration 1C

### *Storage and Conveyance*

#### *Plant Communities and Associated Wildlife*

Configuration 1C storage and conveyance features would be the same as those under Configuration 1B, plus a new Clifton Court Forebay intake structure, a channel enlargement along a 4.9-mile reach in Old River, an operable barrier at the head of Old River, and various flow and stage control measures. The Clifton Court Forebay intake structure potentially would affect from 15 to 20 acres of natural plant communities, potentially including emergent wetland, riparian, grassland, and ruderal habitat. Dredging along a 4.9-mile reach of Old River could affect riparian and emergent wetland vegetation along the river. Dredge material would be disposed of on agricultural lands and, therefore, would not affect natural communities. Dredged material was assumed to be held on agricultural lands for 2 years for draining and settling. Consequently, affected agricultural habitats would be temporarily lost until the affected lands were returned to production after removal of the dredged material.

#### *Special-Status Species and Communities*

The channel enlargement along Old River and associated construction could affect as many as 14 special-status species (see Table 8), four rare natural communities, and seven significant natural areas.

### **ALTERNATIVE 2**

## Configuration 2A

Impacts on plant communities and associated wildlife and on special-status species and communities from implementing the Ecosystem Restoration Program and Storage and Conveyance under Configuration 2B would be the same as those discussed for Configuration 2A.

## *Ecosystem Restoration Program*

Impacts of implementing the Ecosystem Restoration Program under Configuration 2A would be similar to those of Configuration 1A, except that some restored shallow-water habitat areas would be located in the east Delta. Restored and enhanced habitat areas identified in the Ecosystem Restoration Program for the south Delta would be located west of flow and stage control structures proposed for the south Delta, and restoration along the North Fork of the Mokelumne River would be limited to establishing a riparian habitat corridor associated with setback levees. Impacts on special-status species and communities under Configuration 2A would be similar to those of Configuration 1A, except that approximately 111,000 acres of agricultural land would be converted to natural plant communities.

### *Storage and Conveyance*

#### *Plant Communities and Associated Wildlife*

Under Configuration 2A, construction of a 10,000-cubic-foot-per-second (cfs) intake facility at Hood would include construction of the intake, pumping plant, and fish bypass structures, and relocation of State Route (SR) 160 and bridge. These activities potentially would disturb and remove natural communities that could include emergent wetland, riparian scrub and woodland, and grassland and ruderal vegetation.

Construction of an open channel from Hood to Lambert Road potentially would remove and disturb natural communities, which could include emergent wetland, riparian scrub and woodland, and grassland and ruderal vegetation.

Construction of a setback channel on the southwestern portion of Glanville Tract would remove and disturb natural communities, which could include emergent wetland, riparian scrub and woodland, and grassland and ruderal vegetation. Approximately 350 to 450 acres of

habitat would be created, including open-water, emergent wetland, riparian scrub, and riparian woodland communities. The created acreage of wetland and riparian plant communities is expected to exceed the affected existing acreage. Grassland and ruderal communities would establish on the new levee slopes.

Construction of a setback channel at McCormack-Williamson Tract potentially would remove and disturb natural communities, which could include emergent wetland, riparian scrub and woodland, and grassland and ruderal vegetation. However, flooding McCormack-Williamson Tract would create approximately 1,600 to 1,700 acres of shallow-water habitat, including open-water and emergent wetland habitats. Riparian scrub and woodland would establish along the levees that would line the flooded island. The created acreage of wetland and riparian plant communities is expected to exceed the affected existing acreage.

North Delta channel modifications would include setback levees, set approximately 500 feet back from the existing levees, along the North Mokelumne River from Interstate 5 to the San Joaquin River. Some acreage of existing natural communities potentially would be removed and disturbed in locations where levees are breeched. These communities could include emergent wetland, riparian scrub and woodland, and grassland and ruderal vegetation. Setting back the levees would create approximately 1,200 to 1,400 acres of habitat that would include open-water and emergent wetland habitats; and would create riparian scrub and woodland along the levees, and grassland and ruderal vegetation on levee slopes. The created acreage of wetland and riparian plant communities is expected to exceed the affected existing acreage.

Construction of an intake facility at Hood would result in impacts on agricultural lands, and an open channel from Hood to Lambert Road would remove agricultural communities. Construction of a setback channel on Glanville Tract would remove up to approximately 450 acres of agricultural communities. Flooding McCormack-Williamson Tract would remove

approximately 1,400 to 1,600 acres of agricultural communities. North Delta channel modifications would remove approximately 1,000 to 1,200 acres of agricultural communities.

### ***Special-Status Species and Communities***

Configuration 2A would affect 12 special-status species (listed in Table 8) and four rare natural communities. Impacts on significant natural areas would depend on the location and alignment of specific features.

### **Configuration 2D**

Impacts of implementing the Ecosystem Restoration Program under Configurations 2D and 2E would be the same as those discussed for Configuration 2A, except that the Ecosystem Restoration Program would restore and enhance habitat areas identified for the south Delta. A portion of shallow-water, tidal freshwater emergent wetland, and riparian habitats in the south Delta would be restored in association with setback levees along Old River.

### ***Storage and Conveyance***

#### ***Plant Communities and Associated Wildlife***

Storage and Conveyance under Configuration 2D would include creation of the Mokelumne River Floodway and east Delta wetlands habitat, and would disturb and remove existing natural communities that potentially include emergent wetland, riparian scrub and woodland, and grassland and ruderal vegetation. Approximately 12,500 to 16,000 acres of habitat would be created and would include shallow open-water, emergent marsh, and riparian woodland and scrub.

Construction of setback levees along Old River on Palm Tract, Orwood Tract, Byron Tract, and Virginia Island set back approximately 3,000 feet from the channel would disturb and remove existing natural communities, which could

include emergent wetland, riparian scrub and woodland, and grassland and ruderal vegetation. This may result in the development of approximately 100 to 200 acres of habitat that would include open-water, emergent wetland, and riparian scrub and woodland. The created acreage of wetland and riparian plant communities is expected to exceed the loss of existing acreage.

Creation of the Mokelumne River Floodway and East Delta wetlands habitat would remove up to approximately 13,000 to 15,000 acres of agricultural communities. Construction of setback levees along Old River would remove approximately 2,600 to 2,900 acres of agricultural communities.

### ***Special-Status Species and Communities***

Storage and Conveyance under Configuration 2D includes the following facilities that would affect special-status species and communities: setting back the levee along the eastern side of Snodgrass Slough, flooding McCormack-Williamson Tract, setting back levees on New Hope Tract, flooding Canal Ranch or Brack Tracts, setting back levees on Terminous Tract, setting back levees on Staten Island, flooding portions of Bouldin Island, and setting back levees along Old River. Configuration 2D could affect 14 special-status species (listed in Table 8) and four rare natural communities. Impacts on significant natural areas would depend on the location and alignment of Configuration 2D features.

## **Configuration 2E**

### ***Storage and Conveyance***

#### ***Plant Communities and Associated Wildlife***

Storage and Conveyance under Configuration 2E would include flooding Tyler Island. Construction of the Mokelumne River Floodway and east Delta wetlands habitat, and flooding Tyler Island would disturb and remove

existing natural communities that could include emergent wetland, riparian scrub and woodland, and grassland and ruderal vegetation.

A total of 21,500 to 26,000 acres of habitat would be created that would include shallow open-water, emergent marsh, and riparian woodland and scrub. The created acreage of wetland and riparian communities is expected to exceed the affected existing acreage.

Flooding Tyler Island would create approximately 8,000 to 9,000 acres of habitat, which could include shallow open-water, emergent wetland, and riparian scrub and woodland. Removal of existing levee sections would remove and disturb existing natural communities, which could include emergent wetland, riparian scrub and woodland, and grassland and ruderal vegetation.

The created acreage of wetland and riparian communities is expected to exceed the affected existing acreage. New grassland and ruderal communities would establish on the new levee slopes.

Construction of the Mokelumne River Floodway and east Delta wetlands habitat, and flooding Tyler Island would remove approximately 21,000 to 23,000 acres of agricultural lands.

### ***Special-Status Species and Communities***

Under Configuration 2E Storage and Conveyance, facilities that would affect special-status species and communities may include setting back levees along Georgiana Slough, flooding Tyler Island and McCormack-Williamson Tract, setting back levees on New Hope Tract, flooding Canal Ranch or Brack Tracts, setting back levees on Terminous Tract, setting back levees on Staten Island, flooding a portion of Bouldin Island, and setting back levees along Old River. Configuration 2E could affect 14 special-status species (listed in Table 8) and four rare natural communities. The number and location of significant natural areas

that could be affected would depend on the location and alignment of Configuration 2E features.

### **ALTERNATIVE 3**

#### **Configuration 3A**

##### ***Ecosystem Restoration Program***

Impacts on special-status species and communities from implementation of the Ecosystem Restoration Program under Configurations 3A, 3B, 3E, and 3H would be the same as those described for Configuration 1A, except that all Ecosystem Restoration Program shallow-water habitat areas would be restored in the east Delta, and restoration along the North Fork of the Mokelumne River would be limited to establishing a riparian-habitat corridor associated with setback levees.

##### ***Storage and Conveyance***

###### ***Plant Communities and Associated Wildlife***

A 45-mile isolated open-channel facility would be constructed along the eastern side of the Delta. The channel would include an intake facility at Hood, a SR 160 bridge relocation site, a fish bypass structure, a pumping plant, access roads, staging areas, and outlet facilities. Construction of the isolated conveyance facility potentially would disturb and remove natural communities, which could include emergent wetland, riparian scrub and woodland, and grassland and ruderal vegetation. The acreage of nonagricultural communities that would be removed is estimated at approximately 100 to 200 acres. The precise area of affected plant communities would depend on the design and location of the facilities. Impacts would be similar if a pipeline was constructed for conveyance, rather than an open channel.

Permanent direct impacts on large riparian areas and associated wetlands at major stream crossings would be avoided by properly designed siphons, but construction of the siphons could disturb riparian scrub and woodland, and emergent wetland and associated wildlife.

Construction of the isolated open-channel facility potentially would result in removal and temporary disturbance of agricultural lands at the intake facility, at the SR 160 bridge relocation site, at the fish bypass structure, at the pumping plant, along the 45-mile channel, along access roads, at staging areas, and at a buried outlet. The potentially affected acreage of agricultural communities is estimated at approximately 700 to 900 acres. The amount of affected area would depend on the design of the facilities.

###### ***Special-Status Species and Communities***

Storage and conveyance facilities would include constructing a new levee set back 500 feet from the existing Mokelumne River channel and converting agricultural lands into open-water and freshwater emergent marsh plant communities. The old levee would be breached and would create channel islands with new riparian and freshwater emergent marsh plant communities. A new channel to be constructed from Hood to Clifton Court Forebay would result in the loss of agricultural habitat. The acreage of loss for conveyance features would depend on the location and alignment of each feature. Configuration 3A could affect 15 special-status species (listed in Table 8), and the valley freshwater marsh and Great Valley willow scrub rare natural communities. During the life of the project, however, Configuration 3A could benefit all the special-status species and rare natural communities as the vegetation along the setback levees matures. The extent to which Configuration 3A would affect significant natural areas would depend on the location and alignment of the features.

Configurations	Open Water	Nonagricultural Habitat	Agricultural Habitat
3B	14,000 - 15,000	2,800 - 3,000	11,200 - 12,000
3E	14,000 - 15,000	2,800 - 3,000	11,200 - 12,000
3I	4,000 - 4,500	800 - 900	3,200 - 3,600

**Table 9. Comparison of Acres of Habitat Types Potentially Affected by Storage Facilities for Configurations 3B, 3E, and 3I in the Delta Region**

## **Configuration 3B**

### ***Storage and Conveyance***

Table 9 compares acres affected by storage facilities for Configurations 3B, 3E, and 3I in the Delta Region

### ***Plant Communities and Associated Wildlife***

Under Configuration 3B, construction of a 200,000 acre-foot in-Delta storage facility would remove and disturb natural communities, which could include emergent wetland, riparian scrub and woodland, and grassland and ruderal vegetation. Specific affected acreages would depend on the size and location of the storage facility. Up to approximately 15,000 acres of open-water habitat of varying depth would be created. Periodically, seasonal wetland and mudflats potentially would be supported in the Delta Region storage facility, which would temporarily support shorebirds and waterfowl.

A 200,000 acre-foot storage facility in the Delta Region potentially would remove approximately 15,000 acres of agricultural lands.

Impacts of implementing Storage and Conveyance on plant communities and associated wildlife under Configuration 3B would be the same as those discussed under Configuration 3A.

### ***Special-Status Species and Communities***

The up to 200,000 acre-feet of surface storage facilities in the Delta Region could affect up to 11 special-status species (listed in Table 10), depending on the location of the facilities. Storage and conveyance could result in a gain in acreage of the following rare natural communities: valley freshwater marsh and Great Valley willow scrub. Effects on significant natural areas in the central Delta would depend on the location of storage facilities.

## **Configuration 3E**

Impacts from implementing are the same as those storage and conveyance discussed for Configuration 3B. Configuration 3E could affect 14 special-status species (listed in Table 8).

## **Configuration 3H**

### ***Storage and Conveyance***

Under Configuration 3H Storage and Conveyance, impacts of the Mokelumne River Floodway, east Delta wetlands habitat, and south Delta habitat modifications would be the same as under Configuration 2D. Impacts of the open-channel isolated facility would be the same as under Configuration 3E. Storage and conveyance features could affect 16 special-status species (listed in Table 8).

Species Common Name	Status <sup>a</sup>			Alternative 1 Variations <sup>b</sup>			Alternative 2 Variations <sup>b</sup>				Alternative 3 Variations <sup>b</sup>				
	Fed. List	CA List	CNPS	A	B	C	A	B	D	E	A	B	E	H	I
<b>Animals</b>															
Buteo swainsoni Swainson's hawk	--	T	--												
Branchinecta lynchi Vernal pool fairy shrimp	T	--													
Clemmys marmorata marmorata Northwestern pond turtle	SC	--	--									(+)	(+)		(+)
Desmocerus californicus dimorphus Valley elderberry longhorn beetle	T	--	--												
Grus canadensis tabida Greater sandhill crane	--	T	--									(+)	(+)		(+)
Laterallus jamaicensis coturniculus California black rail	--	T	--									X	X		X
Thamnophis gigas Giant garter snake	T	T	--									(+)	(+)		(+)
<b>Plants</b>															
Aster lentus Suisun marsh aster	SC	--	1B									(+)	(+)		(+)
Carex comosa Bristly sedge	--	--	2									(+)	(+)		(+)
Cirsium crassicaule Slough thistle	SC	--	1B									(+)	(+)		(+)
Hibiscus lasiocarpus California hibiscus	--	--	2									X	X		X
Juglans hindsii Northern California black walnut	SC	--	1B												
Lathyrus jepsonii var. jepsonii Delta tule pea	SC	--	1B									(+)	(+)		(+)
Lilaeopsis masonii Mason's lilaeopsis	SC	R	1B									X	X		X
Limosella subulata Delta mudwort	--	--	2									X	X		(+)

Table 10. Special-Status Species Potentially Adversely Affected by Proposed Storage Facilities in the Delta Region

Species Common Name	Status <sup>a</sup>			Alternative 1 Variations <sup>b</sup>			Alternative 2 Variations <sup>b</sup>				Alternative 3 Variations <sup>b</sup>				
	Fed. List	CA List	CNPS	A	B	C	A	B	D	E	A	B	E	H	I
<i>Scutellaria galericulata</i> Marsh skullcap	--	--	2												
<i>Tropidocarpum capparideum</i> Caper-fruited tropidocarpum	SC	--	1												
<b>Total special-status species</b>												11	11		11
Vernal pool special-status species habitat (acres) <sup>b</sup>	NA	NA	NA	0	0	0	0	0	0	0	0	0	0	0	0
<p>NOTES:</p> <p><sup>a</sup> Status abbreviations:  Federal (DFG 1997)                      State (DFG 1997)                      CNPS (Skinner and Pavlik 1994)  E = Endangered.                      E = Endangered.                      1A = Presumed extinct.  T = threatened.                      T = Threatened.                      1B = Species that are rare, threatened, or endangered throughout their range.  C = Candidate.                      R = Rare.                      2 = Species that are rare, threatened, or endangered in California but more common elsewhere.  SC = Species of concern.</p> <p><sup>b</sup> No storage components are associated with Alternatives 1, 2A, 2B, 2D, 2E, 3A, and 3H.</p> <p><sup>c</sup> Vernal pool special-status species landscape includes the watershed areas that support several of the species indicated in this table. The database used for estimating acres affected is Holland (1997), a more accurate database than the California DFG's NDDDB, which is used for evaluating presence of individual species.</p> <p>Symbols:  X = A known occurrence of a species within conveyance facilities.  (+) = A presumed occurrence of a species based on the likely presence of suitable habitat.</p> <p>SOURCE:  DFG 1997.</p>															

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**Table 10. Special-Status Species Potentially Adversely Affected by Proposed Storage Facilities in the Delta Region (Continued)**



## Configuration 3I

### *Ecosystem Restoration Program*

Impacts from implementing the Ecosystem Restoration Program would be the same as those discussed for Configuration 1A, except that under Configuration 3I, some shallow-water habitat areas to be restored under the Ecosystem Restoration Program would be located in the east Delta, and restored and enhanced habitat areas identified in the Ecosystem Restoration Program for the south Delta located near the proposed new diversions would be relocated to the northern and western Delta.

### *Storage and Conveyance*

Storage facilities would be tied in with the 15,000-cfs western conveyance facilities. For example, if Holland Tract was selected for this purpose, potentially 600 to 700 acres of natural communities, including emergent wetland, riparian scrub, riparian wetland, grassland, and ruderal vegetation, would be affected. The precise acreages to be removed or disturbed would depend on the design of the storage facility. Approximately 4,000 to 4,500 acres of open-water habitat, varying in depth, would be created. Periodically, seasonal wetland and mudflats potentially would be supported in the Delta Region storage facility, which would temporarily support shorebirds and waterfowl. In addition, a 500-foot-wide zone on the eastern side of Holland Tract would be dedicated to conveyance.

If storage facilities were sited on Holland Tract, approximately 3,500 to 3,700 acres of agricultural lands would be affected.

Construction of western, northern, and eastern south Delta intakes, and isolated conveyance facility channels potentially would disturb and remove natural communities, which could include emergent wetland, riparian scrub and woodland, and grassland and ruderal vegetation.

Construction of setback levees set approximately 500 feet back along the western

side of Old River potentially would disturb and remove natural communities, which could include emergent wetland, riparian scrub and woodland, and grassland and ruderal vegetation. New emergent wetland, riparian scrub, and woodland would be created. Approximately 500 to 600 acres of habitat would be created to include shallow open-water, emergent wetland, and riparian scrub and woodland. The created acreage of wetland and riparian plant communities is expected to exceed the affected existing acreage.

New herbaceous upland communities, including grassland and ruderal vegetation, would be created on the new levee slopes.

Construction of western, northern, and eastern south Delta intakes and isolated conveyance channels, and the 500-foot setback levee along Old River, would remove approximately 900 to 1,000 acres of agricultural lands.

The northern isolated Sacramento River intake and conveyance channel would include a screened intake at Hood, and an open 15,000-cfs conveyance channel from Hood to the diversion on the San Joaquin River. The potential impacts of this facility, in combination with the eastern south Delta intake and conveyance facility, would be the same as the potential impacts of the 15,000-cfs isolated facility described under Configuration 3E, except for additional potential impacts of the intake facility on the San Joaquin River. This intake facility could include a low-lift pumping facility and other structures. These facilities potentially would disturb and remove natural communities, which could include emergent wetland, riparian scrub and woodland, and grassland and ruderal vegetation. The affected acreages would depend on the design and location of the facilities.

The intake facility also potentially would result in loss of agricultural lands. The affected acreage would depend on the design and location of the facility.

## ***Special-Status Species and Communities***

Configuration 3I Storage and Conveyance would include the construction of isolated channels in the southern Delta, and around the eastern Delta with no through-Delta conveyance facility. Configuration 3I primarily would affect the agricultural community, with the potential to affect 13 special-status species (listed in Table 8). Configuration 3I also could affect many of the significant natural areas in the southern Delta area. The exact number would depend on the location and alignment of the features.

Impacts from Storage and Conveyance would be the same as under Configuration 3B, if the facility was located on Holland Tract.

## **BAY REGION**

Table 11 identifies impacts and benefits in the Bay Region from implementing CALFED alternatives. Table 12 summarizes the wildlife species and Table 13 summarizes the special-status species that could be adversely affected or benefit from decreases or increases in the area or quality of open-water, wetland, riparian, upland habitats, and agricultural lands in the Bay Region under CALFED alternatives. The level of impact and benefits on terrestrial biological resources would be the same for each alternative and for all configurations; therefore, impacts are described only for Configuration 1A.

## **ALTERNATIVE 1**

### **Configuration 1A**

### ***Ecosystem Restoration Program***

#### ***Plant Communities and Associated Wildlife***

Implementation of the Ecosystem Restoration Program in the Bay Region would result in a net increase in natural plant community types of up

to 2,500 acres of shallow tidal perennial aquatic habitat; 12,000 acres of tidally influenced saline emergent wetland; 30 miles of tidally influenced sloughs and 500 acres of deep open-water areas within restored saline emergent wetlands; 4,000 acres of seasonal wetlands; 75 linear miles of riparian scrub (up to approximately 675 acres); and 4,000 acres of perennial grassland. The Ecosystem Restoration Program also would improve management of 1,000 acres of existing degraded seasonal wetlands.

Implementation of the Ecosystem Restoration Program could affect up to approximately 14,500 acres of existing diked saline emergent wetland as a result of restoring tidal flow. Other actions proposed in the Ecosystem Restoration Program primarily would result in the loss of agricultural lands. Some existing wetland, riparian, and grassland habitats would be lost or converted to open-water or other natural plant communities.

Existing natural terrestrial communities such as grassland and ruderal habitats could be affected by restoration of seasonal wetland, riparian, and perennial grassland habitats. Potentially affected communities generally are dominated by exotic grasses and forbs, and typically are associated with rangelands and abandoned agricultural lands. Potential direct impacts on these habitats would result primarily from flooding to restore seasonal wetlands. Conversion of existing annual grassland to perennial grassland would cause temporary

CALFED Program	Impact Category	Impact/ Benefit	No Action Alternative	Alternative 1			Alternative 2				Alternative 3				
				A	B	C	A	B	D	E	A	B	E	H	I
Ecosystem Restoration, Water Quality, and Water Use Efficiency	Habitat Area and Associated Wildlife	Temporary loss or disturbance of wetland and riparian communities		-	-	-	-	-	-	-	-	-	-	-	-
		Permanent loss of wetland and riparian communities		-	-	-	-	-	-	-	-	-	-	-	-
		Permanent loss of wintering waterfowl foraging habitat		-	-	-	-	-	-	-	-	-	-	-	-
		Potential for increased incidence of waterfowl disease		--	--	--	--	--	--	--	--	--	--	--	--
		Increase in open-water and wetland communities		++	++	++	++	++	++	++	++	++	++	++	++
		Increase in riparian communities		++	++	++	++	++	++	++	++	++	++	++	++
	Habitat Quality and Pattern	Improved wetland habitat quality		++	++	++	++	++	++	++	++	++	++	++	++
		Reduction in nonnative invasive plant abundance		++	++	++	++	++	++	++	++	++	++	++	++
		Improved habitat patterns		++	++	++	++	++	++	++	++	++	++	++	++
		Improved connectivity of riparian habitat		++	++	++	++	++	++	++	++	++	++	++	++
	Special-Status Species and Communities	Loss of foraging habitat for special-status species		-	-	-	-	-	-	-	-	-	-	-	-
		Increase in habitats for special-status species		++	++	++	++	++	++	++	++	++	++	++	++
		Expansion of rare natural communities and significant natural areas		++	++	++	++	++	++	++	++	++	++	++	++

NOTE:

- or + indicates a relative adverse (-) or beneficial (+) impact. The larger number of symbols represents a greater degree of change in habitat acres.

Table 11. Summary of Potentially Significant Impacts and Benefits in the Bay Region

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Habitat Type	Number of Associated Wildlife Species
Open water <sup>a</sup>	50
Wetlands	
Seasonal wetlands <sup>b</sup>	71
Saline emergent wetlands <sup>c</sup>	<u>54</u>
Wetlands subtotal	<b>82</b>
Valley foothill riparian	114
Grassland	79
Agricultural lands <sup>d</sup>	109
NOTES:	
Numbers of species determined from Table S-1 in the Supplement.	
<sup>a</sup> Includes species listed in Supplement under deep open-water and shallow open-water habitats.	
<sup>b</sup> Includes species listed in Supplement under agriculture-wetland and mudflat (nontidal species only) habitats.	
<sup>c</sup> Includes species listed in Supplement under saline emergent wetland and mudflat habitats.	
<sup>d</sup> Includes species listed in Supplement under agriculture-wetland and agriculture-upland habitats.	

**Table 12. Number of Wildlife Species Associated with Habitat Types Potentially Created, Improved, or Affected Under All Alternatives in the Bay Region**

Species Common Name	Status <sup>a</sup>		
	Federal	State	CNPS
<b>Animals</b>			
<i>Agelaius tricolor</i>	SC	--	--
Tricolored blackbird			
<i>Antrozous pallidus</i>	--	--	--
Pallid bat			
<i>Aquila chrysaetos</i>	--	--	--
Golden eagle			
<i>Ardea herodias</i>	--	--	--
Great blue heron			
<i>Asio flammeus</i>	--	--	--
Short-eared owl			
<i>Athene cunicularia</i>	--	--	--
Burrowing owl			
<i>Charadrius alexandrinus nivosus</i>	T	--	--
Western snowy plover			
<i>Danaus plexippus</i>	--	--	--
Monarch butterfly			
<i>Elanus leucurus</i>	--	--	--
White-tailed kite			
<i>Geothlypis trichas sinuosa</i>	SC	--	--
Saltmarsh common yellowthroat			
<i>Laterallus jamaicensis coturniculus</i>	SC	T	--
California black rail			
<i>Lepidurus packardi</i>	E	--	--
Vernal pool tadpole shrimp			
<i>Melospiza melodia maxillaris</i>	SC	--	--
Suisun song sparrow			
<i>Pandion haliaetus</i>	--	--	--
Osprey			
<i>Pogonichthys macrolepidotus</i>	PE	--	--
Sacramento splittail			
<i>Rallus longirostris obsoletus</i>	E	E	--
California clapper rail			
<i>Rana aurora draytoni</i>	PE	--	--
California red-legged frog			
<i>Reithrodontomys raviventris</i>	E	E	--
Salt marsh harvest mouse			
<i>Sorex ornatus sinuosus</i>	C	--	--
Suisun shrew			
<i>Sterna antillarum browni</i>	E	E	--
California least tern			
<i>Sterna caspia</i>	--	--	--
Caspian tern			
<i>Syncaris pacifica</i>	E	E	--
California freshwater shrimp			
<b>Plants</b>			
<i>Aster lentus</i>	SC	--	1B
Suisun marsh aster			
<i>Astragalus tener</i> var. <i>tener</i>	--	--	1B
Alkali milk-vetch			
<i>Atriplex depressa</i>	--	--	1B
Brittlescale			

Species Common Name	Status <sup>a</sup>		
	Federal	State	CNPS
<i>Atriplex joaquiniana</i>	SC	--	1B
San Joaquin saltbush			
<i>Balsamorhiza macrolepis</i> var. <i>macrolepis</i>	--	--	1B
Big-scale balsamroot			
<i>Blepharizonia plumosa</i> ssp. <i>plumosa</i>	--	--	1B
Big tarplant			
<i>Calochortus pulchellus</i>	--	--	1B
Mount Diablo fairy-lantern			
<i>Castilleja affinis</i> ssp. <i>neglecta</i>	E	T	1B
Tiburon Indian paintbrush			
<i>Cirsium hydrophilum</i> var. <i>hydrophilum</i>	PE	--	1B
Suisun thistle			
<i>Cordylanthus mollis</i> ssp. <i>hispidus</i>	SC	--	1B
Hispid bird's-beak			
<i>Cordylanthus mollis</i> ssp. <i>mollis</i>	PE	R	1B
Soft bird's-beak			
<i>Delphinium recurvatum</i>	SC	--	1B
Recurved larkspur			
<i>Downingia pusilla</i>	C3	--	2
Dwarf downingia			
<i>Fritillaria liliacea</i>	SC	--	1B
Fragrant fritillary			
<i>Hemizonia parryi</i> ssp. <i>congdonii</i>	C	--	1B
Congdon's tarplant			
<i>Isocoma arguta</i>	SC	--	1B
Carquinez goldenbush			
<i>Lasthenia conjugens</i>	PE	--	1B
Contra Costa goldfields			
<i>Lathyrus jepsonii</i> var. <i>jepsonii</i>	SC	--	1B
Delta tule pea			
<i>Lilaeopsis masonii</i>	SC	R	1B
Mason's lilaeopsis			
<i>Limosella subulata</i>	--	--	2
Delta mudwort			
<i>Madia radiata</i>	--	--	1B
Showy madia			
<i>Monardella villosa</i> ssp. <i>globosa</i>	--	--	1B
Round-head coyote mint			
<i>Oenothera deltoides</i> ssp. <i>howellii</i>	E	E	1B
Antioch dunes evening-primrose			
<i>Polygonum marinense</i>	SC	--	3
Marin knotweed			
<i>Senecio aphanactis</i>	--	--	2
Rayless ragwort			
<i>Trifolium amoenum</i>	PE	--	1B
Showy Indian clover			
<b>Total special-status species</b>	<b>30</b>	<b>9</b>	<b>26</b>
Vernal pool special-status species habitat (acres) <sup>b</sup>	NA	NA	NA

Table 13. Potentially Affected Special-Status Species in the Bay Region

NOTES:

X = Occurrences or potential occurrences of species that could be affected by CALFED alternatives. Impacts would occur in lowland habitat, such as wetlands and riparian habitats.

<sup>a</sup> Status abbreviations:

Federal (DFG 1997)

E = Endangered.

T = Threatened.

PE = Proposed endangered.

C = Candidate.

SC = Species of concern.

C3 = Common.

State (DFG 1997)

E = Endangered.

T = Threatened.

R = Rare.

CNPS (Skinner and Pavlik 1994)

1B = Species that are rare, threatened, or endangered throughout their range.

2 = Species that are rare, threatened, or endangered in California but more common elsewhere.

3 = Species where more information is needed to determine listing.

<sup>b</sup> Vernal pool special-status species landscape includes the watershed areas that support several of the species indicated in this table. The database used for estimating affected acres is Holland (1997), a more accurate database than the California DFG's NDDDB, which is used to evaluate the presence of individual species.

SOURCE:

DFG 1997.

**Table 13. Potentially Affected Special-Status Species in the Bay Region (Continued)**

ground disturbance but would improve habitat quality for native plants and wildlife. Relatively small grassland and ruderal habitat areas potentially would be affected by reestablishment of corridors of riparian habitat adjacent to water courses. Losses of grassland and ruderal habitats would be partially or completely offset by restoration of perennial grassland and the natural reestablishment of herbaceous vegetation along higher elevation margins of restored wetland and riparian habitats that are not farmed.

Approximately 700 acres of riparian communities such as scrub, woodland, and forest would be directly restored. Because the type of riparian community that would be restored depends on site-specific conditions, such as local hydrology and soils, the area of each type of riparian community that would be restored is not predictable. Little or no existing riparian vegetation is expected to be directly affected by implementation of the Ecosystem Restoration Program, because most restoration activities would occur in the Suisun Marsh and in existing or historical tidal wetland areas adjacent to San Pablo Bay, where little or no riparian vegetation is present. Restoration of riparian corridors along sloughs and channels would increase the connectivity

among existing fragmented riparian areas in the Bay Region. The quality of existing riparian habitats that are treated to control exotic plant species also would increase because treated habitats would become increasingly dominated by native plants as a result of lessening competition with exotic species.

An unknown quantity of riparian vegetation also would reestablish naturally as a result of restoration of other habitat types. Riparian vegetation would be expected to establish along the margins of restored tidal slough, shallow-water, and wetland habitat areas where salinity and soil moisture conditions would be suitable to sustain riparian vegetation.

Up to approximately 19,500 acres of open-water and wetland habitats would be restored or enhanced under the Ecosystem Restoration Program. Existing open-water and wetland habitats would be affected by restoration of tidal perennial aquatic, tidal slough, wetland, and riparian habitats. Affected wetlands are primarily diked saline emergent wetlands that are largely in agricultural land uses. Direct impacts would result from breaching or removal of dikes to restore tidal flows to historical saline emergent wetlands, and periodic flooding of diked wetlands to restore seasonal wetland habitats.

Approximately 54 species associated with saline emergent wetlands could benefit from reestablishment of tidal flow to historical saline emergent wetlands (Table 12). An unpredictable quantity of tideflats also would be associated with restoration of saline emergent wetlands.

Major agricultural cover types include grain and hay crops, row crops, truck crops, pasture, and orchards and vineyards. An estimated 8,000 to 11,000 acres of agricultural lands could be lost as a result of implementation of the Ecosystem Restoration Program. The impact of the loss of agricultural land on wildlife depends on the affected cover type and attendant land use practices. Approximately 109 species of wildlife are known to make use of agricultural lands in the Bay Region (Table 12).

### ***Special-Status Species and Communities***

The Bay Region is dominated by chaparral communities and also contains coniferous forests, hardwood forests, riparian areas, beaches and cliffs, grasslands, and wetlands. Proposed habitat restoration under the Ecosystem Restoration Program would contain several components. Substantial acreage of leveed land would be converted to tidal wetlands and shallow aquatic habitat. This habitat alteration would benefit most special-status species found in the Bay Region (Table 13) because many of these species inhabit emergent wetlands and riparian areas. Agricultural lands, some of which would be lost as a result of the Ecosystem Restoration Program, provide foraging areas for the white-tailed kite and the burrowing owl. Implementation of the Ecosystem Restoration Program in the Bay Region would result in a net benefit to the white-tailed kite because nesting and roosting trees are the primary limiting factor for the species. Other habitat restoration components would include protection and enhancement of agricultural land uses and practices that support wildlife, protection and enhancement of riverine habitats on channel islands, and restoration of riparian and shallow-water habitats along levees. These activities

would benefit most, if not all, special-status species in the Bay Region.

Six rare natural communities and 26 significant natural areas are known or have the potential to occur in the Bay Region. These communities and significant natural areas support most of the special-status wildlife species in the region and would be positively affected by the Ecosystem Restoration Program in the long term by the expansion and direct restoration of suitable native habitat through the previously mentioned activities. Habitat restoration would have an additional positive impact on the region by providing contiguous tracts of habitat where only fragmented portions currently exist. Impacts and benefits resulting from implementation of the Ecosystem Restoration Program would be similar for all alternative variations.

### ***Water Quality Program and Coordinated Watershed Management***

Benefits associated with the Water Quality and watershed management program elements would be similar for all configurations.

### ***Plant Communities and Associated Wildlife***

The impacts and benefits of implementing the Water Quality Program would be the same as those described under Configuration 1A for the Delta Region.

### ***Special-Status Species and Communities***

Under the Water Quality Program, improvements in water quality would benefit most of the 48 special-status species either directly, by improving the health of individuals of the species, or indirectly by improving the quality of their habitat. Similarly, these water quality improvements are expected to positively affect the six rare natural communities and the 26 significant natural areas of the Bay Region.

## SACRAMENTO RIVER REGION

Table 14 summarizes beneficial and adverse impacts on vegetation and wildlife for the Sacramento River Region. Table 15 summarizes the number of wildlife species that could be adversely affected or that could benefit from decreases or increases in the area or quality of open-water, wetland, riparian, and upland habitats in the Sacramento River Region with CALFED alternatives. The level of impact and benefits on terrestrial biological resources would be the same for each alternative; therefore, impacts are described only for Alternative 1.

### ALTERNATIVE 1

#### **Configuration 1A**

Impacts of implementing all programs under Configurations 1B, 2A, 2D, and 3A in the Sacramento River Region would be the same as those discussed under Configuration 1A. Impacts of implementing programs under Configurations 2E, 3E, 3H, and 3I would be the same as under Configuration 1A, except impacts for Storage and Conveyance. Impacts for Storage and Conveyance would be the same as those under Configuration 1C, except off-aqueduct surface water storage would increase from 1 to 2 million acre-feet (MAF). No new storage and conveyance facilities are planned for the Sacramento River Region under Configurations 1A and 3A.

#### ***Ecosystem Restoration Program***

Under Alternative 1, the Ecosystem Restoration Program would result in the direct and indirect restoration, enhancement, or protection of up to an estimated 34,000 acres of riparian and associated floodplain habitats along the Sacramento River and its major tributaries. Improvements in riparian habitat primarily would result in the loss of agricultural and range lands adjacent to streams and rivers. A relatively small area of native plant communities could be temporarily or

permanently affected by riparian habitat improvements, depending on the type of improvement actions that are implemented.

Impacts of implementing the Ecosystem Restoration Program would be the same for all configurations in the Sacramento River Region.

#### ***Plant Communities and Associated Wildlife***

The primary objective of the Ecosystem Restoration Program in the Sacramento River Region is to improve ecological processes and habitat conditions that are critical to sustaining and improving anadromous fish populations. Proposed program activities that could affect terrestrial biological resources include restoration and protection of stream meander belts; maintaining or improving the floodwater and sediment detention and retention capacity of important hydrological basins; restoration of floodplain processes, such as overbank flooding of floodplains and stream channel migration; and restoration, enhancement, or protection of riparian vegetation to provide SRA cover. Partial restoration of the ecological processes that sustain healthy riverine ecosystems on affected streams would result in a more natural pattern of stream channel migration, bank erosion, and overbank flooding that are important factors in maintaining healthy riparian and other associated floodplain habitats.

Implementation of the Ecosystem Restoration Program primarily would affect natural terrestrial communities such as grassland and ruderal communities located adjacent to stream channels. Types of actions that could affect these communities include levee setbacks, modification of levee maintenance practices to increase the area and quality of riparian vegetation, modification of streamflows, and exclusion of livestock from stream channels and adjacent banks. Grassland and ruderal communities generally are dominated by exotic grasses and forbs, and typically are associated with rangelands and abandoned agricultural lands. Setting back levees, reducing the adverse effects of grazing along channels, and changing



CALFED Program	Impact Category	Impact/Benefit	No Action Alternative	Alternative 1			Alternative 2				Alternative 3				
				A	B	C	A	B	D	E	A	B	E	H	I
Ecosystem Restoration, Water Quality, Water Use Efficiency, and Levee System Integrity	Habitat Area and Associated Wildlife	Temporary loss or disturbance of wetland and riparian communities		-	-	-	-	-	-	-	-	-	-	-	-
		Permanent loss of wetland and riparian communities		--	--	--	--	--	--	--	--	--	--	--	--
		Permanent loss of wintering waterfowl foraging habitat		-	-	-	-	-	-	-	-	-	-	-	-
		Decrease in important deer and elk use areas		0	0	0	0	0	0	0	0	0	0	0	0
		Decrease in important wildlife habitats		0	0	0	0	0	0	0	0	0	0	0	0
		Increase in open-water and wetland communities		++	++	++	++	++	++	++	++	++	++	++	++
		Increase in riparian communities		++	++	++	++	++	++	++	++	++	++	++	++
	Habitat Quality and Pattern	Reduction in quality of wetland and riparian communities		0	0	0	0	0	0	0	0	0	0	0	0
		Improved riparian habitat quality		++	++	++	++	++	++	++	++	++	++	++	++
		Improved habitat patterns		++	++	++	++	++	++	++	++	++	++	++	++
		Improved connectivity of riparian habitat		++	++	++	++	++	++	++	++	++	++	++	++
	Special-Status Species and Communities	Loss of foraging habitat for special- status species		-	-	-	-	-	-	-	-	-	-	-	-
		Loss of portions of rare natural communities and significant natural		0	0	0	0	0	0	0	0	0	0	0	0
		Increase in habitats for special-status species		++	++	++	++	++	++	++	++	++	++	++	++
		Expansion of rare natural communities and significant natural areas		++	++	++	++	++	++	++	++	++	++	++	++

Table 14. Summary of Potentially Significant Impacts and Benefits in the Sacramento River Region



CALFED Program	Impact Category	Impact/Benefit	No Action Alternative	Alternative 1			Alternative 2				Alternative 3				
				A	B	C	A	B	D	E	A	B	E	H	I
Storage (Continued)	Habitat Area and Associated Wildlife (Continued)	Decrease in important deer and elk use areas		0	0	--	0	--	0	--	0	--	--	--	--
		Decrease in important wildlife habitats		0	0	--	0	--	0	--	0	--	--	--	--
		Increase in open-water and wetland communities		0	0	++	0	++	0	++	0	++	++	++	++
		Increase in riparian communities		0	0	0	0	0	0	0	0	0	0	0	0
	Habitat Quality and Pattern	Reduction in quality of wetland and riparian communities		0	0	--	0	--	0	--	0	--	--	--	--
		Improved riparian habitat quality		0	0	0	0	0	0	0	0	0	0	0	0
		Improved habitat patterns		0	0	0	0	0	0	0	0	0	0	0	0
		Improved connectivity of riparian habitat		0	0	0	0	0	0	0	0	0	0	0	0
	Special-Status Species and Communities	Loss of foraging habitat for special-status species		0	0	0	0	-	0	-	0	-	-	-	-
		Loss of portions of rare natural communities and significant natural		0	0	--	0	--	0	--	0	--	--	--	--
		Increase in habitats for special-status species		0	0	+	0	+	0	+	0	+	+	+	+
		Expansion of rare natural communities and significant natural areas		0	0	0	0	0	0	0	0	0	0	0	0

NOTE:

- or + indicates a relative adverse (-) or beneficial (+) impact. The larger number of symbols represents a greater degree of change in habitat acres.

Table 14. Summary of Potentially Significant Impacts and Benefits in the Sacramento River Region (Continued)

Habitat Type	Number of Associated Wildlife Species
Open water <sup>a</sup>	49
Wetlands <sup>b</sup>	93
Riparian	
Valley foothill riparian	152
Montane riparian	<u>108</u>
Riparian subtotal	181
Grassland	80
Valley foothill hardwood	151
Montane hardwood	66
Chaparral	67
Mixed hardwood-conifer	80
Ponderosa pine	70
Agricultural lands <sup>c</sup>	129
NOTES:	
Numbers of species determined from Table S-1 in the Supplement.	
<sup>a</sup> Includes species listed in Supplement under deep open-water and shallow open-water habitats.	
<sup>b</sup> Includes species listed in Supplement under freshwater emergent wetland, mudflat, and agriculture-wetlands habitats.	
<sup>c</sup> Includes species listed in Supplement under agriculture-wetlands and agriculture-upland habitats.	

**Table 15. Number of Wildlife Species Associated with Habitat Types Potentially Created, Improved, or Affected Under All Alternatives in the Sacramento Region**

the timing and magnitude of streamflows would change local groundwater and surface water hydrology. In some locations, these changes potentially would be sufficient to result in the gradual conversion of annual grassland to riparian and wetland communities.

Implementation of the Ecosystem Restoration Program under Alternative 1 would result in the restoration, enhancement, or protection of up to an estimated 34,000 acres of riparian habitat. Because the type of riparian community that would be restored depends on site-specific conditions, such as local hydrology and soils, the area of each type of riparian community that would be restored could not be predicted. Restoration of riparian habitats primarily would be achieved through restoration of floodplain

processes that would create the conditions necessary for the natural reestablishment of riparian vegetation. In some portions of the Sacramento River Region, some existing riparian scrub, woodland, and forest could be affected by construction of levee setbacks.

The quality of existing riparian habitats that are treated to control exotic plant species also would increase, because treated habitats would become increasingly dominated by native plants as a result of lessening competition with exotic species.

Implementation of the Ecosystem Restoration Program could increase the area of open-water and wetland communities associated with stream courses and flood basins in the

Sacramento Region. Actions that restore channel meander could result in the creation of oxbow lakes in future years as channels migrate across their floodplains. Increasing the area over which floodwaters is detained, the amount of floodwater detained, or the frequency with which floodwater is detained in overflow basins of the Sacramento River (the Yolo Bypass) would potentially increase the area of seasonal wetland and open-water habitats.

Under Alternative 1, implementation of the Ecosystem Restoration Program would restore up to 34,000 acres of riparian habitat and potentially increase the area, duration, or frequency of flooding in some basins. Restoration of riparian habitat primarily would affect agricultural lands immediately adjacent to the Sacramento River and its tributaries. Some riparian habitat would be restored within existing stream meander belts and along levees that are not in agricultural production. Changes to flood patterns in overflow basins could result in the permanent loss of agricultural lands or a change in agricultural cropping patterns and practices to accommodate changes in flood regimes.

Approximately 129 species of wildlife associated with agricultural lands in the Sacramento River Region potentially would be affected by implementation of the Ecosystem Restoration Program (Table 15).

### ***Special-Status Species and Communities***

The lowland areas of the Sacramento River Region are dominated by agricultural land. Proposed habitat restoration in the region would permanently convert some agricultural land to natural plant communities, such as riparian and wetland. This habitat alteration could benefit many of the 46 special-status species (listed in Table 16), because the majority of these species inhabit freshwater emergent wetlands, lakes, rivers on the valley floor, and riparian areas, which could be increased under restoration plans. Grain crops, some of which would be lost as a result of the Ecosystem Restoration

Program, provide habitat for prey species of the Swainson's hawk. Because the primary limiting factor for the Swainson's hawk is nesting and roosting trees, however, implementation of the Ecosystem Restoration Program would result in a net overall beneficial impact on this species in the Sacramento River Region.

Seventeen rare natural communities and 188 significant natural areas including vernal pools are known or have the potential to occur in the Sacramento River Region. Many of these communities occur along the Sacramento River or other major regional rivers and tributaries. The rare natural communities include Fremont cottonwood riparian forest, valley oak riparian forest, mixed riparian forest, Great Valley willow scrub, valley freshwater marsh, and other wetland habitats. These communities support most of the special-status wildlife species and would be positively affected by the Ecosystem Restoration Program in the long-term by the expansion of suitable habitat through programs such as the direct restoration of native habitat, enhancement of natural meanders, and conversion of formerly cultivated lands.

### ***Water Quality Program and Coordinated Watershed Management***

Benefits resulting from implementation of the Water Quality and Coordinated Watershed Management program elements would be similar for all configurations.

### ***Plant Communities and Associated Wildlife***

The impacts and benefits of implementing the Water Quality Program would be the same as those described under Configuration 1A for the Delta Region.

### ***Special-Status Species and Communities***

Under the Water Quality Program, improvements in water quality would benefit

Species Common Name	Status <sup>a</sup>			Alternative 1 Configurations			Alternative 2 Configurations				Alternative 3 Configurations				
	Fed. List	CA List	CNPS	A	B	C	A	B	D	E	A	B	E	H	I
<b>Animals</b>															
<i>Ambystoma californiense</i> California tiger salamander	C	CSC	--			X		X		X		X	X	X	X
<i>Aquila chrysaetos</i> Golden eagle	--	CSC	--												
<i>Ascaphus truei</i> Tailed frog	SC	CSC	--												
<i>Branchimnecta lynchi</i> Vernal pool fairy shrimp	T	--	--			(+)		(+)				(+)	(+)	(+)	
<i>Lepidurus packardii</i> Vernal pool tadpole shrimp	E	--	--			(+)		(+)				(+)	(+)	(+)	(+)
<i>Buteo swainsoni</i> Swainson's hawk	--	T	--			(+)		(+)		(+)		(+)	(+)	(+)	(+)
<i>Clemmys marmorata marmorata</i> Northwestern pond turtle	SC	CSC	--			X		X		X		X	X	X	X
<i>Coccyzus americanus occidentalis</i> Western yellow-billed cuckoo	--	E	--												
<i>Dendroica petechia brewsteri</i> Yellow warbler	--	CSC	--												
<i>Desmocerus californicus dimorphus</i> Valley elderberry longhorn beetle	T	--	--			X		X		X		X	X	X	X
<i>Falco mexicanus</i> Prairie falcon	--	CSC	--			X		X		X		X	X	X	X
<i>Grus canadensis tabida</i> Greater sandhill crane	--	T	--			(+)		(+)		(+)		(+)	(+)	(+)	(+)
<i>Haliaeetus leucocephalus</i> Bald eagle	T	E	--												
<i>Hydromantes shastae</i> Shasta salamander	SC	T	--												
<i>Martes pennanti pacifica</i> Pacific fisher	SC	CSC	--												
<i>Monadenia troglodytes</i> Shasta sideband snail	SC	--	--												

**Table 16. Special-Status Species Potentially Adversely Affected by Proposed Storage Facilities in the Sacramento River Region**

Species Common Name	Status <sup>a</sup>			Alternative 1 Configurations			Alternative 2 Configurations				Alternative 3 Configurations				
	Fed. List	CA List	CNPS	A	B	C	A	B	D	E	A	B	E	H	I
<i>Perognathus inornatus inornatus</i> San Joaquin pocket mouse	--	--	--			X		X		X		X	X	X	X
<i>Plecotus townsendii pallescens</i> Pale big-eared bat	--	CSC	--												
<i>Rana aurora draytonii</i> California red-legged frog	T	CSC	--												
<i>Rana boylei</i> Foothill yellow-legged frog	SC	CSC	--			X		X		X		X	X	X	X
<i>Strix occidentalis caurina</i> Northern spotted owl	T	--	--												
<b>Plants</b>															
<i>Antirrhinum subcordatum</i> Dimorphic snapdragon	--	--	1B			X		X		X		X	X	X	X
<i>Astragalus rattanii</i> var. <i>jepsonianus</i> Jepson's milk vetch	--	--	1B			X		X		X		X	X	X	X
<i>Astragalus tener</i> var. <i>ferrisiae</i> Ferris's milk vetch	SC	--	1B			X		X		X		X	X	X	X
<i>Brodiaea coronaria</i> ssp. <i>rosea</i> Indian Valley brodiaea	SC	E	1B			X		X		X		X	X	X	X
<i>Carex vulpinoidea</i> Fox sedge	--	--	2												
<i>Chlorogalum pomeridianum</i> var. <i>minus</i> Dwarf soaproot	--	--	1B			X		X		X		X	X	X	X
<i>Cryptantha clevelandii</i> var. <i>dissita</i>	--	--	1B												
<i>Downingia pusilla</i> Dwarf downingia	--	--	2			X		X		X		X	X	X	X
<i>Eriastrum brandegeae</i> Brandegee's eriastrum	SC	--	1B			X		X		X		X	X	X	X
<i>Eriogonum nervulosum</i> Snow Mountain buckwheat	SC	--	1B			X		X		X		X	X	X	X
<i>Fritillaria pluriflora</i> Adobe lily	SC	--	1B			X		X		X		X	X	X	X

Table 16. Special-Status Species Potentially Adversely Affected by Proposed Storage Facilities in the Sacramento River Region (Continued)

Species Common Name	Status <sup>a</sup>			Alternative 1 Configurations			Alternative 2 Configurations				Alternative 3 Configurations				
	Fed. List	CA List	CNPS	A	B	C	A	B	D	E	A	B	E	H	I
<i>Hesperolinon bicarpellatum</i> Two-carpellate western flax	SC	--	1B			X		X		X		X	X	X	X
<i>Hesperolinon breweri</i> Brewer's western flax	SC	--	1B			X		X		X		X	X	X	X
<i>Hesperolinon drymarioides</i> Drymaria-like western flax	SC	--	1B			X		X		X		X	X	X	X
<i>Hesperolinon</i> sp. nov "serpentinum" Napa western flax	--	--	1B			X		X		X		X	X	X	X
<i>Hesperolinon tehamense</i> Tehama County western flax	SC	--	1B			X		X		X		X	X	X	X
<i>Juncus leiospermus</i> var. <i>leiospermus</i> Red Bluff dwarf rush	--	--	1B			X		X		X		X	X	X	X
<i>Layia septentrionalis</i> Colusa layia	--	--	1B			X		X		X		X	X	X	X
<i>Lewisia cantelovii</i> Cantelow's lewisia	--	--	1B			X		X		X		X	X	X	X
<i>Madia hallii</i> Hall's madia	SC	--	1B			X		X		X		X	X	X	X
<i>Navarretia leucocephala</i> ssp. <i>bakeri</i> Baker's navarretia	--	--	1B			X		X		X		X	X	X	X
<i>Navarretia rosulata</i> Marin County navarretia	--	--	1B			X		X		X		X	X	X	X
<i>Neviusia cliftonii</i> Shasta snow-wreath	--	--	1B			X		X		X		X	X	X	X
<i>Paronychia ahartii</i> Ahart's paronychia	SC	--	1B			X		X		X		X	X	X	X
<i>Streptanthus morrisonii</i> <i>kruckebergii</i> Kruckeberg's jewel-flower	SC	--	1B			X		X		X		X	X	X	X
<b>Total special-status species</b>						<b>31</b>		<b>31</b>		<b>31</b>		<b>31</b>	<b>31</b>	<b>31</b>	<b>31</b>
Vernal pool special-status species habitat (acres) <sup>b</sup>	NA	NA	NA	0	0	9,873	0	9,873	0	9,873	0	9,873	9,873	9,873	9,873

Table 16. Special-Status Species Potentially Adversely Affected by Proposed Storage Facilities in the Sacramento River Region (Continued)



**NOTES:**

- X = A known occurrence of a species within a storage footprint.  
 (+) = A presumed occurrence of a species within a storage footprint based on the likely presence of suitable habitat.  
 N/A = Not applicable.

**a Status abbreviations:****Federal (DFG 1997)**

- E = Endangered.  
 T = Threatened.  
 C = Candidate.  
 SC = Species of concern.

**State (DFG 1997)**

- E = Endangered.  
 T = Threatened.  
 R = Rare.  
 CSC = Species of concern.

**CNPS (Skinner and Pavlik 1994)**

- 1A = Presumed extinct.  
 1B = Species that are rare, threatened, or endangered throughout their range.  
 2 = Species that are rare, threatened, or endangered in California but more common elsewhere.

- b** Vernal pool special-status species landscape includes the watershed areas that support several of the species indicated in this table. The database used for estimating acres affected is Holland (1997), a more accurate database than the California DFG's database, which is used for evaluating the presence of individual species.

**SOURCE:**

DFG 1997.

**Table 16. Special-Status Species Potentially Adversely Affected by Proposed Storage Facilities in the Sacramento River Region (Continued)**

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most of the 46 special-status species (listed in Table 16) either directly, by improving the health of individuals of the species, or indirectly, by improving the quality of their habitat. Similarly, these water quality improvements could positively affect the 17 rare natural communities and many of the 188 significant natural areas of the Sacramento River Region.

## **Configuration 1C**

### ***Storage and Conveyance***

#### ***Plant Communities and Associated Wildlife***

Configuration 1C Storage and Conveyance could affect up to an estimated 32,000 acres. Proposed storage facilities include up to 3 MAF of new surface water storage and 250,000 acre-feet of groundwater storage in the Sacramento River Region. New surface storage could be developed by enlarging existing storage reservoirs or developing new off-stream storage. The analysis of new storage facilities was based on potential impacts associated with enlarging two existing reservoirs and four hypothetical off-stream storage locations in the foothills surrounding the Sacramento Valley. Consequently, this analysis is only representative of the types of impacts that could occur under Configuration 1C. The habitat types and area that actually would be affected by increasing storage would depend on the siting and design of storage facilities.

Table 15 summarizes the numbers of wildlife species typically associated with each of the habitat types that could be affected by construction of storage facilities.

Enlargement of existing reservoirs could result in temporary or permanent loss or disturbance of wetland, riparian, annual grassland, valley foothill hardwood, chaparral, montane hardwood, montane hardwood conifer, and ponderosa pine communities, and agricultural lands as a result of inundation and construction

of roads and other infrastructure. For example, enlargement of Shasta Reservoir could affect up to approximately 12,000 acres of wetland, montane, riparian, valley foothill hardwood, montane hardwood, chaparral, mixed hardwood conifer, and ponderosa pine communities and, as a result of inundation, could create up to approximately 12,000 acres of open-water habitat. Construction of new off-stream storage facilities could result in temporary or permanent loss or disturbance of wetland, valley foothill riparian, annual grassland, valley foothill hardwood, montane hardwood, mixed hardwood conifer, and chaparral communities. For example, construction of the previously proposed off-stream sites/Colusa Reservoir could affect up to approximately 30,000 acres of valley foothill hardwood and montane hardwood habitat, and create up to 30,000 acres of open-water habitat. Construction of off-stream reservoirs also could result in the loss or degradation of valley foothill riparian habitat downstream of reservoirs, as a result of interrupting sediment supply to the stream channel and altering stream hydrology. Some habitat types that could be lost or degraded as a result of constructing storage facilities, such as valley oak woodland, could have declined locally or regionally sufficiently from historical conditions such that additional losses could substantially affect associated wildlife populations.

Implementation of Configuration 1C would benefit wildlife species associated with open-water habitats and would result in loss of habitat for species associated with affected habitats. The wildlife value of habitats surrounding reservoirs for some species also could be degraded if public access and levels of recreation substantially increased. Construction of off-stream reservoirs could fragment important habitats and disrupt wildlife movement patterns. The potential effects of fragmenting riparian habitats would be similar to those described for the Delta Region.

Depending on the siting and design of enlarged or off-stream storage facilities, substantial fragmentation of upland and riparian habitats could disrupt traditional movement patterns of

migratory deer herds. Local and migratory deer herds also could be adversely affected if storage reservoirs, attendant facilities, and associated recreational uses resulted in loss or degradation of DFG-designated critical deer winter range and fawning habitats, or other important deer use areas. Tule elk populations also could be adversely affected, if calving habitat was lost or degraded.

If groundwater storage was achieved by percolating water through water-spreading grounds, construction of water-spreading grounds and associated facilities could result in the temporary or permanent loss of annual grassland and agricultural habitat types, assuming that these facilities would be constructed in lowland areas of the Sacramento River Valley. The actual area and habitat types that would be affected by construction and operation of groundwater recharge facilities, would depend on the siting, design, and operations of facilities. Shallow open-water habitat would be created when surface water was retained on spreading grounds. Mudflats and bare ground would be created as surface water was drawn down. To maintain percolation efficiency, however, spreading grounds likely would be maintained to be devoid of vegetation. Consequently, these created habitats probably would provide low forage and cover values for associated wildlife.

Storage and Conveyance infrastructure associated with operation of off-stream surface and groundwater storage facilities would result in loss of habitat along conveyance corridors. The magnitude of habitat losses and types of habitat affected would depend on facility design and siting.

### ***Special-Status Species and Communities***

Configuration 1C Storage and Conveyance would include up to 3 MAF of water storage on Sacramento River Region tributaries (by enlarging existing storage or by creating new off-stream storage), and up to 250,000 acre-feet of groundwater storage in the Sacramento

Valley. Although the potential for loss of habitat and impacts on special-status species from surface water storage could not be precisely determined until location of expanded or new surface storage facilities is known, 31 special-status species (listed in Table 16) could be affected.

Special-status species, rare natural communities, and significant natural areas could be affected by the construction of groundwater storage facilities. In addition, special-status aquatic species and aquatic plant communities could be affected, depending on how groundwater storage was diverted and what effects these diversions have on water quality. The type and extent of impacts on special-status species, rare natural communities, and significant natural areas from construction and operation of groundwater storage facilities would depend on the locations and operations of the storage facilities, which are undetermined.

## **SAN JOAQUIN RIVER REGION**

Table 17 summarizes impacts and benefits of implementing CALFED alternatives in the San Joaquin River Region. Table 18 summarizes the number of wildlife species that could be adversely affected or benefit from decreases or increases in the area or quality of open-water, wetland, riparian, and upland habitats in the San Joaquin River Region under all alternatives. Table 19 summarizes the relative potential level of impact on habitats, and Table 20 presents the habitat types that could be affected as a result of constructing storage facilities under each alternative.

### **ALTERNATIVE 1**

#### **Configuration 1A**

Impacts of implementing all programs under Configurations 1B, 2A, 2D, and 3A in the San Joaquin River Region would be the same as those under Configuration 1A. Impacts of implementing programs under Configurations 2E, 3B, 3E, 3H, and 3I would be the same as those under Configuration 1A, except impacts

for Storage and Conveyance would be the same as those under Configuration 1C. Off-aqueduct surface water storage includes 1 MAF for Configuration 1C and 2 MAF for other configurations.

## ***Ecosystem Restoration Program***

### ***Plant Communities and Associated Wildlife***

The primary objective of the Ecosystem Restoration Program in the San Joaquin River Region is the same as for the Sacramento River Region. Implementation of the Ecosystem Restoration Program would result in similar impacts in the San Joaquin River Region as those for the Sacramento River Region. Implementation of the Ecosystem Restoration Program in the San Joaquin River Region would restore up to an estimated 11,000 acres of riparian habitat. Approximately 128 species of wildlife associated with agricultural lands in the San Joaquin River Region potentially would be affected by implementation of the Ecosystem Restoration Program (Table 18).

### ***Special-Status Species and Communities***

The San Joaquin River Region is dominated by agricultural land (of which pasture and orchards and vineyards are most abundant), foothill hardwood trees, grassland, and mixed coniferous forest. Proposed habitat restoration under the Ecosystem Restoration Program would contain several components. Some agricultural land would be fallowed or permanently converted to riparian and wetland communities. This habitat alteration would benefit many of the special-status species listed in Table 21 because the majority of these species inhabit freshwater emergent wetlands, lakes, rivers on the valley floor, and riparian areas. Pasture lands, some of which would be lost as a result of conversion to wetland or

shallow-water habitats, provide foraging areas for the Swainson's hawk. Because the primary limiting factor for this species is nesting and roosting trees, however, implementing the Ecosystem Restoration Program would result in a net overall benefit to the species. Other habitat restoration components would include enhancement of riparian communities along the San Joaquin River, restoration of riparian habitat on major tributaries of the San Joaquin River, and restoration of spawning areas in waterways. These activities would benefit most, if not all, special-status species in the San Joaquin River Region.

Nineteen rare natural communities, and 77 significant natural areas including vernal pools are known or have the potential to occur in the San Joaquin River Region (Table 21). Many of these communities occur along the San Joaquin River or other major regional rivers and tributaries, and include various riparian forests, scrublands, grasslands, marshes, and other wetland habitats. These communities support most of the special-status wildlife species, and would be positively affected by the Ecosystem Restoration Program in the long term, by the expansion and direct restoration of suitable native habitat through the previously mentioned activities. Impacts and benefits resulting from Ecosystem Restoration Program implementation would be similar for all configurations.

## ***Water Quality Program and Coordinated Watershed Management***

### ***Plant Communities and Associated Wildlife***

The impacts and benefits of implementing the Water Quality and Coordinated Watershed Management program elements would be the same as those described under Configuration 1A for the Delta Region.

CALFED Program	Impact Category	Impact/Benefit	No Action Alternative	Alternative 1			Alternative 2				Alternative 3				
				A	B	C	A	B	D	E	A	B	E	H	I
Ecosystem Restoration, Water Quality, and Water Use Efficiency	Habitat Area and Associated Wildlife	Temporary loss or disturbance of wetland and riparian communities		-	-	-	-	-	-	-	-	-	-	-	-
		Permanent loss of wetland and riparian communities		--	--	--	--	--	--	--	--	--	--	--	--
		Permanent loss of wintering waterfowl foraging habitat		-	-	-	-	-	-	-	-	-	-	-	-
		Decrease in important deer and elk use areas		0	0	0	0	0	0	0	0	0	0	0	0
		Decrease in important wildlife habitats		0	0	0	0	0	0	0	0	0	0	0	0
		Increase in open-water communities		0	0	0	0	0	0	0	0	0	0	0	0
		Increase in riparian communities		++	++	++	++	++	++	++	++	++	++	++	++
	Habitat Quality and Pattern	Reduction in quality of wetland and riparian communities		0	0	0	0	0	0	0	0	0	0	0	0
		Improved riparian habitat quality		++	++	++	++	++	++	++	++	++	++	++	++
		Improved habitat patterns		++	++	++	++	++	++	++	++	++	++	++	++
		Improved connectivity of riparian habitat		++	++	++	++	++	++	++	++	++	++	++	++
	Special-Status Species and Communities	Loss of foraging habitat for special-status species		-	-	-	-	-	-	-	-	-	-	-	-
		Loss of portions of rare natural communities and significant natural areas		0	0	0	0	0	0	0	0	0	0	0	0
		Increase in habitats for special-status species		++	++	++	++	++	++	++	++	++	++	++	++
		Expansion of rare natural communities and significant natural areas		++	++	++	++	++	++	++	++	++	++	++	++

Table 17. Summary of Potentially Significant Impacts and Benefits in the San Joaquin River Region

CALFED Program		Storage		Wildlife		Habitat Area and Associated		Habitat Quality and Pattern		Special-Status Species and Communities		Expansion of rare natural communities and significant natural areas	
Impact Category	Impact/Benefit	No Action		Alternative 1		Alternative 2		Alternative 3					
		A	B	A	B	A	B	A	B	A	B	A	B
Habitat Area and Associated	Temporary loss or disturbance of wetland and riparian communities	0	0	0	0	0	0	0	0	0	0	0	0
	Permanent loss of wetland and riparian communities	0	0	0	0	0	0	0	0	0	0	0	0
	Decrease in important deer and elk use areas	0	0	0	0	0	0	0	0	0	0	0	0
	Decrease in important wildlife habitats	0	0	0	0	0	0	0	0	0	0	0	0
	Increase in open-water communities	0	0	0	0	0	0	0	0	0	0	0	0
	Increase in riparian communities	0	0	0	0	0	0	0	0	0	0	0	0
	Reduction in quality of wetland and riparian communities	0	0	0	0	0	0	0	0	0	0	0	0
Habitat Quality and Pattern	Improved riparian habitat quality	0	0	0	0	0	0	0	0	0	0	0	0
	Improved habitat patterns	0	0	0	0	0	0	0	0	0	0	0	0
	Improved connectivity of riparian habitat	0	0	0	0	0	0	0	0	0	0	0	0
	Permanent loss of wintering waterfowl foraging habitat	0	0	0	0	0	0	0	0	0	0	0	0
	Permanent loss of wintering waterfowl foraging habitat	0	0	0	0	0	0	0	0	0	0	0	0
	Increase in habitats for special-status species	0	0	0	0	0	0	0	0	0	0	0	0
	Expansion of rare natural communities and significant natural areas	0	0	0	0	0	0	0	0	0	0	0	0

NOTE: - or + indicates a relative adverse (-) or beneficial (+) impact. The larger number of symbols represents a greater degree of change in habitat acres.

Habitat Type	Number of Associated Wildlife Species
Open water <sup>a</sup>	48
Wetlands <sup>b</sup>	91
Valley foothill riparian	145
Grassland	80
Valley foothill hardwood	148
Agricultural lands <sup>c</sup>	128
NOTES:	
Numbers of species determined from Table S-1 in the Supplement.	
<sup>a</sup>	Includes species listed in Supplement under open-water deep and open-water shallow habitats.
<sup>b</sup>	Includes species listed in Supplement under freshwater emergent wetlands, mudflat, and agriculture wetland habitats.
<sup>c</sup>	Includes species listed in Supplement under agriculture-wetlands and agriculture-upland habitats.

**Table 18. Number of Wildlife Species Associated with Habitat Types Potentially Created, Improved, or Affected Under All Alternatives in the San Joaquin River Region**

Configurations	Potentially Created Open Water	Potentially Affected Non-agricultural Habitat	Potentially Affected Agricultural Habitat
1C	+	-	-
2B	+++	---	---
2D	++	--	--
2E	+++	---	---
3B	+++	---	---
3E	+++	---	---
3H	+++	---	---
3I	+++	---	---
NOTES:			
+ = Increase in habitat acres.			
- = Decrease in habitat acres.			
The larger number of symbols represents a greater degree of change in habitat acres.			

**Table 19. Comparison of Levels of Impact on Habitat Types from Storage Facilities Under Configurations in the San Joaquin River Region**

Habitat Type	Alternative 1	Alternative 2	Alternative 3
Wetlands	X	X	X
Valley foothill riparian	X	X	X
Montane riparian		X	X
Annual grassland	X	X	X
Montane hardwood		X	X
Valley foothill hardwood	X	X	X
Agricultural lands	X	X	X

**Table 20. Habitat Types Potentially Affected by Construction of Storage Facilities Under All Alternatives in the San Joaquin River Region**

Species Common Name	Status*			Alternative 1 Configurations			Alternative 2 Configurations				Alternative 3 Configurations				
	Fed List	CA List	CNPS	A	B	C	A	B	D	E	A	B	E	H	I
<b>Animals</b>															
<i>Agelaius tricolor</i> Tricolored blackbird	SC	--	--												
<i>Ambystoma californiense</i> California tiger salamander	C	CSC	--			X		X		X		X	X	X	X
<i>Ammospermophilus nelsoni</i> San Joaquin antelope squirrel	C	T	--					X		X		X	X	X	X
<i>Aquila chrysaetos</i> Golden eagle	--	CSC	--												
<i>Athene cunicularia</i> Burrowing owl	--	--	--					X		X		X	X	X	X
<i>Branchinecta lynchi</i> Vernal pool fairy shrimp	T	--	--					X		X		X	X	X	X
<i>Buteo swainsoni</i> Swainson's hawk	--	T	--					X		X		X	X	X	X
<i>Carpenteria californica</i> Tree-anemone	PT	T	--					X		X		X	X	X	X
<i>Clemmys marmorata</i> Western pond turtle	--	--	--			X		X		X		X	X	X	X
<i>Coccyzus americanus occidentalis</i> Western yellow-billed cuckoo	--	E	--												
<i>Dipodomys heermanni dixonii</i> Merced kangaroo rat	--	--	--					X		X		X	X	X	X
<i>Dipodomys nitratoideis exilis</i> Fresno kangaroo rat	E	E	--					X CH		X CH		X CH	X CH	X CH	X CH
<i>Dipodomys nitratoideis nitratoideis</i> Tipton kangaroo rat	E	E	--					X		X		X	X	X	X
<i>Eumops perotis californicus</i> California mastiff bat	SC	--	--												
<i>Falco mexicanus</i> Prairie falcon	--	CSC	--					X		X		X	X	X	X

Table 21. Special-Status Species Potentially Adversely Affected by Proposed Storage Facilities in the San Joaquin River Region



Species Common Name	Status <sup>a</sup>			Alternative 1 Configurations			Alternative 2 Configurations				Alternative 3 Configurations				
	Fed List	CA List	CNPS	A	B	C	A	B	D	E	A	B	E	H	I
<i>Gambelia silus</i> Blunt-nosed leopard lizard	E	E	--					X		X		X	X	X	X
<i>Grus canadensis tabida</i> Greater sandhill crane	--	T	--					(+)		(+)		(+)	(+)	(+)	(+)
<i>Gymnogyps californianus</i> California condor						CH		CH		CH		CH	CH	CH	CH
<i>Lampetra hubbsi</i> Kern brook lamprey	SC	--	--			X		X		X		X	X	X	X
<i>Lepidurus packardii</i> Vernal pool tadpole shrimp	E	--	--					X		X		X	X	X	X
<i>Lytta hoppingi</i> Hoppings blister beetle	SC	--	--					X		X		X	X	X	X
<i>Lytta molesta</i> Molestan blister beetle	SC	--	--					X		X		X	X	X	X
<i>Masticophis flagellum ruddocki</i> San Joaquin whipsnake	SC	--	--					X		X		X	X	X	X
<i>Perognathus inornatus inornatus</i> San Joaquin pocket mouse	--	--	--					X		X		X	X	X	X
<i>Plegadis chihi</i> White-faced ibis	SC	--	--			X		X		X		X	X	X	X
<i>Riparia riparia</i> Bank swallow	--	T	--					X		X		X	X	X	X
<i>Scaphiopus hammondi</i> Western spadefoot toad	SC	--	--					X		X		X	X	X	X
<i>Thamnophis gigas</i> Giant garter snake	T	T	--			X		X		X		X	X	X	X
<i>Vulpes macrotis mutica</i> San Joaquin kit fox	E	T	--					X		X		X	X	X	X
<i>Linderiella occidentalis</i> California linderiella	--	--	--					X		X		X	X	X	X

Table 21. Special-Status Species Potentially Adversely Affected by Proposed Storage Facilities in the San Joaquin River Region (Continued)

Species Common Name	Status <sup>a</sup>			Alternative 1 Configurations			Alternative 2 Configurations				Alternative 3 Configurations				
	Fed List	CA List	CNPS	A	B	C	A	B	D	E	A	B	E	H	I
<b>Plants</b>															
<i>Atriplex cordulata</i> Heartscale	SC	--	1B					X		X		X	X	X	X
<i>Atriplex depressa</i> Brittlescale	--	--	1B					X		X		X	X	X	X
<i>Atriplex minuscule</i> Lesser saltscale	--	--	1B					X		X		X	X	X	X
<i>Atriplex vallicola</i> Lost Hills crownscale	SC	--	1B					X		X		X	X	X	X
<i>Castilleja campestris</i> ssp. <i>succulenta</i> Succulent owl's-clover	PT	E	1B					X		X		X	X	X	X
<i>Caulanthus californicus</i> California jewelflower	E	E	1B					X		X		X	X	X	X
<i>Cordylanthus palmatus</i> Palmate-bracted bird's-beak	E	E	1B					X		X		X	X	X	X
<i>Delphinium recurvatum</i> Recurved larkspur	SC	--	1B					X		X		X	X	X	X
<i>Downingia pusilla</i> Dwarf downingia	--	--	2					X		X		X	X	X	X
<i>Eriastrum hooveri</i> Hoover's eriastrum	T	--	4					X		X		X	X	X	X
<i>Gratiola heterosepala</i> Boggs Lake hedge-hyssop	--	E	1B			X		X		X		X	X	X	X
<i>Lasthenia glabrata</i> ssp. <i>coulteri</i> Coulter's goldfields	SC	--	1B					X		X		X	X	X	X
<i>Layia munzii</i> Munz's tidy-tips	--	--	1B					X		X		X	X	X	X
<i>Lembertia congdonii</i> San Joaquin woollythreads	E	--	1B					X		X		X	X	X	X
<i>Linanthus serrulatus</i> Madera linanthus	--	--	1B					X		X		X	X	X	X

Table 21. Special-Status Species Potentially Adversely Affected by Proposed Storage Facilities in the San Joaquin River Region (Continued)

Species Common Name	Status <sup>a</sup>			Alternative 1 Configurations			Alternative 2 Configurations				Alternative 3 Configurations				
	Fed List	CA List	CNPS	A	B	C	A	B	D	E	A	B	E	H	I
<i>Orcuttia inaequalis</i> San Joaquin Valley orcutt grass	PE	E	1B					X		X		X	X	X	X
<i>Pseudobahia bahiifolia</i> Hartweg's golden sunburst	PE	E	1B					X		X		X	X	X	X
<i>Pseudobahia peirsonii</i> San Joaquin adobe sunburst	PE	E	1B					X		X		X	X	X	X
<i>Sagittaria sanfordii</i> Sanford's arrowhead	SC	--	1B			X		X		X		X	X	X	X
Total special-status species						7		44		44		44	44	44	44
Vernal pool special-status species habitat (acres) <sup>b</sup>	NA	NA	NA	0	0	0	0	53509	0	53509	0	53509	53509	53509	53509

NOTES:

X = A known occurrence of a species within a storage footprint.  
(+) = A presumed occurrence of a species within a storage footprint based on the likely presence of suitable habitat.  
CH = Critical habitat.

<sup>a</sup> Status abbreviations:

Federal (DFG 1997)

E = Endangered.  
T = Threatened.  
PE = Proposed endangered.  
PT = Proposed threatened.  
C = Candidate.  
SC = Species of concern.

State (DFG 1997)

E = Endangered.  
T = Threatened.  
R = Rare.  
CSC = Species of concern.

CNPS (Skinner and Pavlik 1994)

1A = Presumed extinct.  
1B = Species that are rare, threatened, or endangered throughout their range.  
2 = Species that are rare, threatened, or endangered in California but more common elsewhere.  
4 = Species has a limited distribution in California.

<sup>b</sup> Vernal pool special-status species landscape [*habitat*] includes the watershed areas that support several of the species indicated in this table. The database used for estimating acres affected is Holland (1997), a more accurate database than the DFG's NDDb, which is used for evaluating the presence of individual species.

SOURCE:

DFG 1997.

**Table 21. Special-Status Species Potentially Adversely Affected by Proposed Storage Facilities in the San Joaquin River Region (Continued)**

## ***Special-Status Species and Communities***

Under the Water Quality Program, improvements in water quality would benefit most of the 48 special-status species listed in Table 21 directly, by improving the health of individuals of the species, or indirectly, by improving the quality of their habitat. Similarly, these water quality improvements could positively affect many of the 19 rare natural communities and 77 significant natural areas of the San Joaquin River Region. The benefits of implementing the Water Quality Program would be similar for all configurations.

### **Configuration 1C**

#### ***Storage and Conveyance***

##### ***Plant Communities and Associated Wildlife***

Under Configuration 1C, Storage and Conveyance could affect up to an estimated 16,000 acres. Changes in the area or quality of plant communities affected by storage facilities also would potentially affect wildlife populations associated with those plant communities. Table 19 shows the relative impact of construction of storage facilities on habitats.

Beneficial and adverse impacts of storage reservoirs and storage facilities are the same as those described for the Sacramento River Region, assuming that storage facilities would be constructed in foothill habitats along the western side of the San Joaquin Valley. Table 18 summarizes the numbers of wildlife species typically associated with each of the habitat types that could be affected by construction of storage facilities.

## ***Special-Status Species and Communities***

The Configuration 1C Storage and Conveyance would include up to 500,000 acre-feet of groundwater storage in the San Joaquin Valley. Up to seven special-status aquatic animal and plant species could be affected from groundwater storage facilities (Table 21), depending on how groundwater storage is diverted and how diversions affect water quality. Other adverse and beneficial impacts on special-status species and communities associated with Storage and Conveyance are the same as those described for the Sacramento River Region.

### **ALTERNATIVE 2**

#### **Configuration 2B**

#### ***Storage and Conveyance***

Impacts from Storage and Conveyance for Configurations 2D, 2E, 3B, 3E, 3H, and 3I are the same as those for Configuration 2B.

##### ***Plant Communities and Associated Wildlife***

The Configuration 2B Storage and Conveyance could affect up to an estimated 24,000 acres. Impacts of construction of 2 MAF of off-aqueduct storage and associated facilities would be similar to those described for construction of 1 MAF of off-aqueduct storage, except that the habitat area affected, and the area of open-water created with storage of an additional 1 MAF under Configuration 2B potentially would be greater. Table 19 describes the relative impact of construction of storage facilities on habitats compared to other variations. Table 18 summarizes the numbers of wildlife species typically associated with each of the habitat types that could be affected by construction of storage facilities.

Under Configuration 2B, 500,000 acre-feet of new surface storage would be developed by either enlarging existing storage reservoirs, or developing new off-stream storage. The analysis of new storage facilities is based on the potential impacts that would be associated with the enlargement of an existing reservoir, and a hypothetical off-stream storage location in the foothills surrounding the San Joaquin Valley.

Other beneficial and adverse impacts associated with enlarging an existing reservoir or developing new off-stream storage in the San Joaquin River Region would be the same as those described earlier for Configuration 1C and for the Sacramento River Region.

### ***Special-Status Species and Communities***

Impacts on 44 special-status species are possible (Table 21) from enlarging an existing reservoir or developing new off-stream storage in the San Joaquin River Region. Adverse and beneficial impacts on special-status species and communities would be the same as those discussed for Configuration 1C.

### **SWP AND CVP SERVICE AREAS OUTSIDE THE CENTRAL VALLEY**

Implementation of CALFED alternatives would have only minor direct impacts on wetland, riparian, and upland communities near streams, reservoirs, and estuaries in SWP and CVP Service Areas Outside the Central Valley. Although the volume and quality of water exported could increase, the destination of the water would be the same as under the No Action Alternative. The small changes that could occur in the quantity and quality of natural terrestrial communities bordering receiving waters were not quantifiable at a programmatic level of detail.

Implementation of CALFED alternatives could induce growth in areas where the volume and

quality of water would be increased. In these areas, residential or commercial growth could remove terrestrial habitat, displace resident species, or reduce the quality of surrounding habitat. These impacts were not quantifiable at a programmatic level of detail.

### ***Comparison of CALFED Alternatives to Existing Conditions***

At the level of detail possible for this programmatic assessment, only small and qualitative differences were identified between the No Action Alternative and existing conditions. Therefore, the analysis of CALFED actions compared to existing conditions would be similar to the comparison to the No Action Alternative (see previous section).

## **MITIGATION STRATEGIES**

### ***All Programs***

Implementation of one or more of these mitigation measures could result in the loss of agricultural or other native habitat types.

Temporary Loss or Disturbance of Wetland and Riparian Communities. Potential mitigation strategies for reducing temporary impacts on wetland and riparian communities associated with construction of conveyance facilities and implementation of the Ecosystem Restoration Program and Levee System Integrity Program could include:

- Avoiding wetland and riparian communities.
- Restoring or enhancing sufficient in-kind wetland and riparian habitat area at offsite locations before or at the time that project impacts associated with the Storage and

Conveyance and Levee System Integrity Program are incurred to offset habitat losses.

- Initially implementing the Ecosystem Restoration Program, to the extent feasible, to restore sufficient wetland and riparian habitats in nonwetland/riparian habitat areas before or at the time that project impacts associated with the Ecosystem Restoration Program are incurred, to minimize the effects of habitat loss.
- Restoring wetland and riparian communities temporarily disturbed by on-site construction activities immediately following construction.

**Permanent Loss of Wetland and Riparian Communities.** Potential mitigation strategies for reducing impacts on wetland and riparian communities associated with construction of conveyance facilities and implementation of the Levee System Integrity Program could include:

- Avoiding wetland and riparian habitats.
- Restoring or enhancing sufficient in-kind wetland and riparian habitat area at offsite locations before or at the time that project impacts are incurred to offset habitat losses.
- Restoring wetland and riparian vegetation onsite immediately following construction.

**Temporary Loss or Disturbance of Wintering Waterfowl Foraging Habitat.** Mitigation strategies for reducing the potential for temporary decreases in the abundance of forage for wintering waterfowl as a result of implementation of the Ecosystem Restoration Program, the Island Subsidence Control Element of the Levee System Integrity Program, and construction of conveyance facilities could include:

- Initially implementing the Ecosystem Restoration Program, to the extent feasible, to restore native waterfowl foraging habitats

on agricultural lands that provide little or no existing waterfowl forage values, to minimize the effects of foraging habitat loss on waterfowl.

- Initially implementing the Ecosystem Restoration Program to the extent feasible, to focus habitat restoration efforts on restoring sufficient high-forage-value wetland habitat area, to minimize the effects of foraging habitat loss on waterfowl.
- Restoring or enhancing sufficient waterfowl foraging habitat to offset impacts on the abundance, quality, and availability of waterfowl forage; specific types of actions potentially include planting crops that produce high forage value on agricultural lands currently planted with low-forage-value crops, or planting winter forage crops on fallowed agricultural lands.

**Permanent Loss of Wintering Waterfowl Foraging Habitat.** Mitigation strategies for reducing the potential for decreased abundance of forage for wintering waterfowl as a result of construction and operation of conveyance facilities could include:

- Restoring or enhancing sufficient waterfowl foraging habitat to offset impacts on the abundance, quality, and availability of waterfowl forage.

**Potential for Increased Incidence of Waterfowl Disease.** Mitigation strategies for reducing the potential for increased incidence of waterfowl diseases as a result of implementing the Ecosystem Restoration Program could include:

- Monitoring waterfowl use of restored and enhanced wetlands to locate incidences of waterfowl disease mortalities.
- Removing carcasses from affected restored and enhanced wetlands to reduce the rate of disease transmission.

- Hazing waterfowl from restored and enhanced wetlands affected by disease outbreaks to reduce the likelihood of disease transmission.
- Where feasible and consistent with habitat restoration objectives, designing wetlands to allow for rapid dewatering during disease outbreaks to discourage use of the affected habitat area by waterfowl.

**Temporary Fragmentation of Riparian Habitats.** Potential mitigation strategies for reducing impacts on riparian communities that could fragment riparian habitat corridors as a result of implementation of the Ecosystem Restoration Program and Levee System Integrity Program could include:

- Avoiding riparian vegetation.
- Restoring or enhancing sufficient riparian habitat area at offsite locations in a manner that reduces the degree of existing habitat fragmentation in the Delta, before or at the time that project impacts are incurred to offset habitat losses.
- Initially implementing the Ecosystem Restoration Program, to the extent feasible, to restore sufficient riparian habitat before or at the time that project impacts on riparian corridors associated with the Ecosystem Restoration Program are incurred, to minimize the effects of fragmentation of riparian habitats and wildlife.
- Restoring riparian vegetation disturbed by onsite construction activities immediately following construction.
- Phasing the implementation of modifications to levees that would be necessary to meet PL-99 standards over a sufficient period to minimize the effects of fragmentation of riparian habitats and associated wildlife.

**Permanent Fragmentation of Riparian Habitats.** Potential mitigation strategies for reducing impacts on riparian communities that could fragment riparian habitat corridors as a result of implementation of the Levee System Integrity Program and construction of conveyance facilities could include:

- Avoiding riparian vegetation.
- Restoring or enhancing sufficient riparian habitat area in a manner that reduces the degree of existing habitat fragmentation in the Delta before or at the time project impacts are incurred to offset habitat losses.
- Restoring riparian vegetation disturbed by onsite construction activities immediately following construction.
- Phasing the implementation of modifications to levees that would be necessary to meet PL-99 standards over a sufficient period that would minimize the effects of fragmentation of riparian habitats and associated wildlife.

**Loss of Foraging Habitat for Special-Status Species.** Potential mitigation strategies for reducing impacts on special-status species in the Delta Region caused by foraging habitat loss within agricultural lands would include:

- Restoring additional grasslands to serve as alternative foraging habitat over and above that restored as part of the Ecosystem Restoration Program.
- Managing agricultural lands for multiple foraging special-status species (flooding fields in fall to provide wintering waterfowl habitat, while leaving the fields drier in spring and summer for other species' use).
- Maximizing the habitat quality of remaining agricultural lands by various wildlife-friendly techniques, such as planting crops of highest forage value.

Minor consequences may result from implementation of these mitigation strategies. For example, flooding agricultural fields may adversely affect those species dependent on drier or upland habitats.

**Loss of Portions of Rare Natural Communities and Significant Natural Areas.**

Potential mitigation strategies for reducing impacts on rare natural communities and significant natural areas resulting from implementation of the Levee System Integrity Program would include:

- Avoiding rare natural communities and significant natural areas.
- Restoring or enhancing disturbed rare natural communities or significant natural areas at other locations before or at the time that Levee System Integrity Program impacts are incurred.
- Restoring rare natural communities or significant natural areas back into affected locations after Levee System Integrity Program activities are completed.

Restoration activities may disturb and adversely affect other existing habitats and communities.

**Decrease in Important Deer and Elk Use Areas.** Potential mitigation strategies for reducing impacts on DFG-designated critical deer winter range and fawning habitat, and tule elk calving habitat as a result of construction of storage facilities could include:

- Avoiding critical deer winter range and fawning habitat, and tule elk calving habitat.
- Restoring habitat areas temporarily disturbed by onsite construction activities immediately following construction.
- Restoring historical, but currently unsuitable, habitat areas in affected watersheds or other watersheds used by the affected deer or elk population if sufficient

historical habitat for restoration was unavailable in the affected watershed.

- Enhancing unaffected habitat areas in affected watersheds or other watersheds used by the affected deer or elk population if sufficient habitat for enhancement was unavailable in the affected watershed.

**Decrease in Important Wildlife Habitats.**

Potential mitigation strategies for reducing impacts on important wildlife upland habitat areas as a result of construction of storage facilities could include:

- Avoiding important wildlife habitat areas.
- Restoring habitat areas temporarily disturbed by onsite construction activities immediately following construction.
- Restoring historical, but currently unsuitable, habitat areas in affected watersheds, or other watersheds if sufficient historical habitat for restoration was unavailable in the affected watershed.
- Enhancing unaffected habitat areas in affected watersheds or other watersheds, if sufficient habitat for enhancement was unavailable in the affected watershed.

**Reduction in Quality of Wetland and Riparian Communities.** Potential mitigation strategies for reducing impacts on the quality of wetland and riparian communities as a result of storage operations could include:

- Maintaining sufficient downstream flow to maintain the existing condition of wetland and riparian communities.

**POTENTIALLY SIGNIFICANT UNAVOIDABLE IMPACTS**

No potentially significant unavoidable impacts are anticipated for any alternative in the Delta and Bay regions.



In the Sacramento River and San Joaquin River regions under all alternatives, existing riparian habitat corridors could be permanently fragmented as a result of inundation of off-stream storage reservoirs, potentially blocking the movement and interchange of populations of some wildlife species from upper to lower watershed locations. This impact could not be mitigated and therefore is considered a potentially significant unavoidable impact.

## **REFERENCES - ENVIRONMENTAL CONSEQUENCES**

Entrix, Inc., and Resource Insights. 1996. Draft Environmental Impact Report/ Environmental Impact Statement (EIR/EIS), Interim South Delta Program (ISDP). Volume 1. Prepared for Department of Water Resources, Sacramento, CA, and U.S. Bureau of Reclamation, Folsom, CA. July. Sacramento, CA.

Jones & Stokes Associates, Inc. 1995. Draft Environmental Impact Report/ Environmental Impact Statement for the Delta Wetlands Project. (JSA 87-119.) Prepared for California State Water Resources Control Board, Division of Water Rights, and U.S. Army Corps of Engineers, Sacramento District. September 11. Sacramento, CA.

McArthur & Wilson. 1967. Theory of Island Biogeography. Princeton University Press. Princeton, MA.

Sawyer, J. O., and T. Keeler-Wolf. 1995. A Manual of California Vegetation. California Native Plant Society. Sacramento, CA.

Skinner, M. W., and B. M. Pavlik. 1994. Inventory of Rare and Endangered Vascular Plants of California. 5th Edition. (Special Publication No. 1.) California Native Plant Society. February. Sacramento, CA.

U.S. Bureau of Reclamation, 1997. Programmatic Environmental Impact Statement for the Central Valley Project Improvement Act. Draft Vegetation and Wildlife Technical Appendix. Mid-Pacific Region. Sacramento, CA.